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Solvents, Adhesives, & Aerosols

PROCEEDINGS OF A SEMINAR HELD IN TORONTO IN MAY, 1977, BY THE ONTARIO MINISTRY OF INDUSTRY AND TOURISM IN COOPERATION WITH THE ADDICTION RESEARCH FOUNDATION

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SOLVENTS, ADHESIVES, & AEROSOLS

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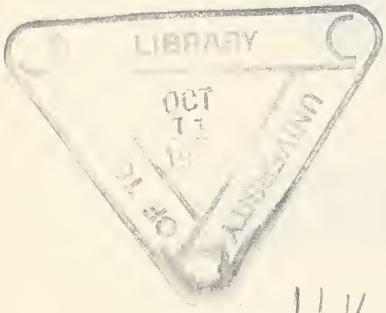
Proceedings of a Seminar Held in Toronto in May, 1977, by the Ontario Ministry of Industry and Tourism in Cooperation with the Addiction Research Foundation

ADDICTION RESEARCH FOUNDATION OF ONTARIO

Toronto, Canada



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INTRODUCTION

Solvent and aerosol abuse has been a recurring phenomenon in the Province of Ontario and many other parts of the world.

Solvents and aerosols impinge upon many aspects of the community. The manufacturers, wholesalers, and retailers form one group. Legitimate consumers and some who misuse solvents and aerosols occupy the middle ground. At the end of the spectrum are the research, treatment, and education personnel. Public health agencies, regulatory bodies, corrections, education, and consumer advocates comprise this latter group. (See Community Resources Chart)

Given the willingness of all of these groups to reduce and eliminate the misuse phenomenon, the conception of the Solvents, Adhesives, & Aerosols Seminar was a very natural process. This seminar, held in Toronto, Ontario on May 11, 1977, sponsored by the Ministry of Industry and Tourism, was the first of its kind in its diversity of participants. All major segments of the community were represented.

There are many aspects to the solvent and aerosol abuse story. These proceedings review the various factors involved. Suggestions are made in terms of coordinated and

comprehensive treatment approaches. Most important, the seminar initiated the exchange of ideas between regulatory agencies, community associations, and many other participants.

Julio Fernandez of LePage's Limited and James Wega of Conn Chem Ltd. provided needed industrial perspectives, in addition to a consideration of the social problems involved. Dr. Vera Gellman of Consumer and Corporate Affairs, Canada exhaustively reviewed the law applicable to these products.

George Rigg of the Kiwanis and Michael Majury of the Metro Toronto Police Department described those community problems associated with solvent sniffing.

Douglas Chaudron of the Addiction Research Foundation provided an historical review of solvent sniffing. Dr. Sidney Cohen of UCLA's Neuropsychiatric Institute highlighted international trends in solvent and aerosol abuse.

Finally, Dr. Adrian Wilkinson of the Addiction Research Foundation described community approaches to treatment and control.

The dialogue established between the various groups was refreshing. We hope this publication will reflect accurately the issues discussed and promote further cooperation in this field.

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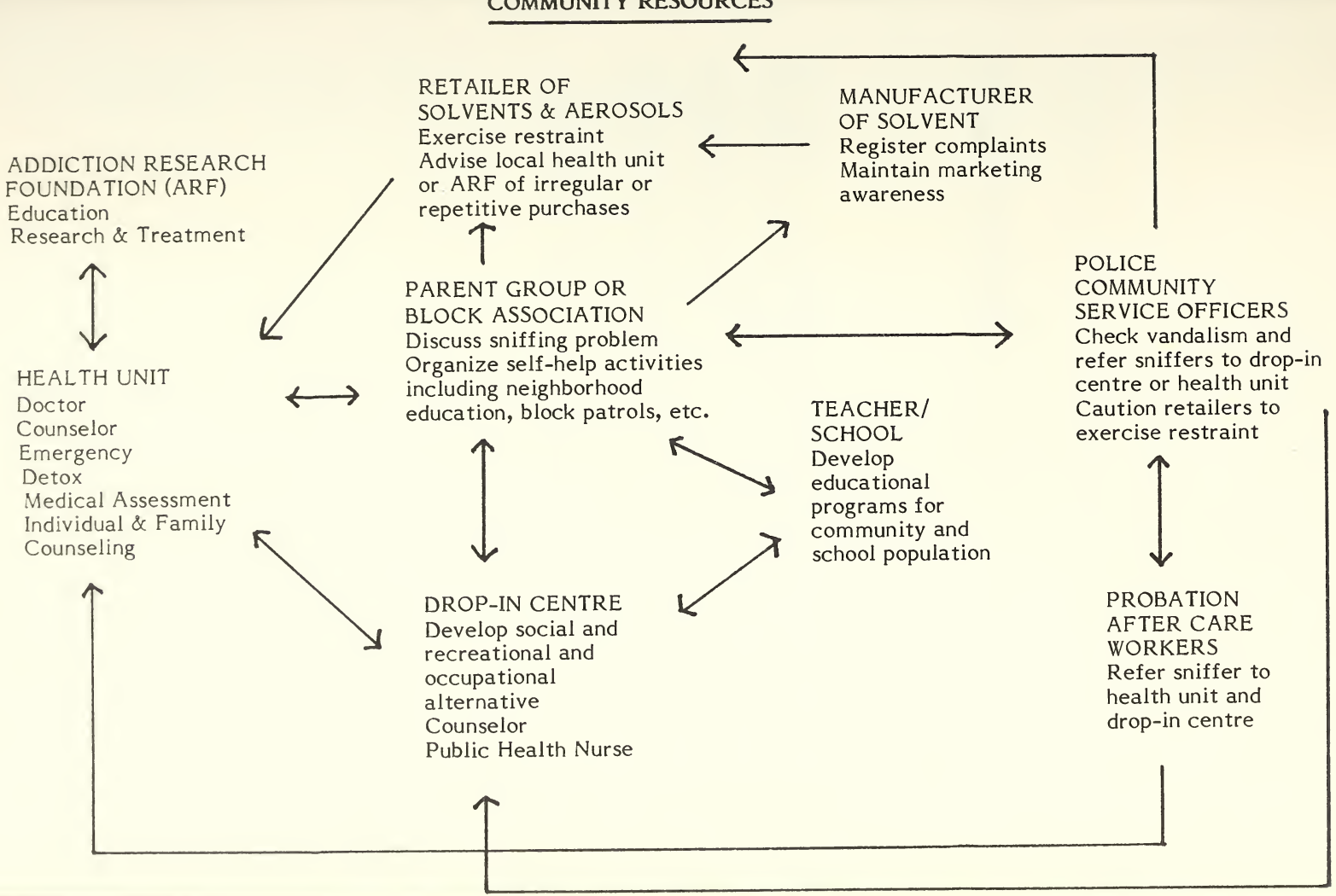
COMMUNITY RESOURCES
RETAILER OF SOLVENTS & AEROSOLS
Exercise restraint
Advise local health unit or ARF of irregular or repetitive purchases
MANUFACTURER OF SOLVENT
Register complaints
Maintain marketing awareness
ADDICTION RESEARCH FOUNDATION (ARF)
Education
Research & Treatment
PARENT GROUP OR BLOCK ASSOCIATION
Discuss sniffing problem
Organize self-help activities including neighborhood education, block patrols, etc.
POLICE COMMUNITY SERVICE OFFICERS
Check vandalism and refer sniffers to drop-in centre or health unit
Caution retailers to exercise restraint
HEALTH UNIT
Doctor
Counselor
Emergency
Detox
Medical Assessment
Individual & Family
Counseling
TEACHER/ SCHOOL
Develop educational programs for community and school population
DROP-IN CENTRE
Develop social and recreational and occupational alternative
Counselor
Public Health Nurse
PROBATION AFTER CARE WORKERS
Refer sniffer to health unit and drop-in centre

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The Seminar on Solvents, Adhesives, and Aerosols could not have been held and this book not published without:

The Ontario Ministry of Industry and Tourism which financed the seminar;

Dr. J. George Kurys and Alec Gabe who conceived the seminar and guided it through to completion;

Patricia Marigold who edited and typed the book;

and Donald Murray who designed it.

SOLVENTS—AN INDUSTRIAL PERSPECTIVE

by Julio A. Fernandez

About 140 years ago there was an Italian shoemaker who did not like glue. Every glue Francesco Rampichini had ever used had come apart when it got wet. One day he decided to do something about it. In one of his experiments he took nitrated cotton, put it in acetone, and to his amazement, he had made the first water resistant adhesive.

In another part of the world, another scientist, moved by the suffering of patients undergoing surgery, was searching for a substance that might put the patient to sleep while surgery was performed. This led Sir Humphry Davy to the discovery of nitrous oxide, the first anesthetic.

History is full of such discoveries. They were made for the benefit of mankind. History shows too, that most such discoveries have a potential for harm that man wastes no time in utilizing. Thus we find that 40 years later nitrous

---

Mr. Fernandez is technical director of LePage's Limited,* Bramalea, Ontario. He is a member of Canadian Government Committees on Adhesives and Sealants, the ASTM, the Forest Products Research Society, and the National Association of Corrosion Engineers.

*LePage's Limited is a Canadian based company not in any way related to a manufacturer of the same name in the United States.

oxide was being abused as an intoxicant and that since the 40s in this century, adhesives were also being abused. In time, intoxication seekers have found that a great many products can likewise be abused which has led Drs. Edward Press and Alan Done (1) to conclude in their very extensive study on volatile addictions that *"It is our impression that the habituation or dependence pertained not to the specific chemical itself, but rather to the state of intoxication. Thus, while most individuals had their definite favorites, almost any intoxicating substance seemed to serve their purposes adequately."*

In the 40s, incidents involving adhesive abuse came to be known as "glue sniffing," a term that is still commonly used today to describe the abuse of any volatiles, or any product containing volatiles.

In the 60s, medical research pointed out the inappropriateness of the name glue sniffing and the word "solvent sniffing" came into use in more enlightened circles. This name still does not apply correctly to all inhaled intoxicants, as some of these are not used by the public as solvents, i.e. gasoline and lighter fluid. and besides, water, too, is a solvent. It is important that this nomenclature be correct for, as we shall see later, semantic errors can lead to errors of a more serious kind.

One thing that all the abused intoxicants have in common, if we exclude the only known exception (nitrous oxide), is that these substances are all volatile and they are all organic. Thus the term "volatile organics" (V.O. for short), is the only term that applies generically to all substances inhaled for intoxication purposes. In order to further define the appellation "volatile" it should be pointed out that all the inhaled intoxicants have a volatility greater than water as measured by the Shell Thin Film Evaporometer. The volatility of some of these substances is shown in Table IV (see page 23).

Inhaled Intoxicants

The products involved contain a great variety of V.O.'s: alcohols, ketones, esters, glycol ethers, aliphatic, naphthenic, olefinic and aromatic hydrocarbons, chlorinated hydrocarbons, etc. Some researchers (1,2) have listed the following V.O. containing products, and some substances which

abusers have obtained in the "relatively pure" form: adhesives (usually called glue), industrial solvent, cleaning fluids, toluene, shoe polish, nailpolish remover, acetone, paint thinners, lighter fluids, cable cleaner, gasoline, lacquer thinner, acrylic paint, gold spray paint, lacquers, hobby cements, spot removers, aerosols. Many others no doubt are involved.

In a study on "The Clinical Toxicology of Solvent Abuse"(2) the diversity of the source of intoxicants had to be emphasized to establish a proper cause/effect relationship. This study states: *"The inappropriateness of the label 'glue sniffer' is shown by the observation that only one patient reported any regular recreational inhalation of glue. Most preferred toluene based spray paint and even specified that gold spray paint provided unique psychoactive effects not found in other colors."*

In Table I, products containing V.O.'s are listed along with the volatile contained. These volatiles and their toxicities are shown in Table II.

A study of the products in Table I shows the extent to which V.O.'s are enmeshed in our everyday life, a fact that the average person may not be fully aware of. Among these are products which give us *protection*: a masonry water repellent; or *food*: the fuel for a farm tractor; or *convenience*: a paint and varnish remover; or *conservation*: adhesives to repair things, etc. Every time we shine shoes, clean typewriter keys, send clothes to the cleaners, we make use of a V.O.

Before the 1800's there were only a handful of V.O.'s available, but then there were not typewriters to clean, the land was tilled by the sweat of the brow, and shoe shining was often a concern of non-owners. Clothes were cleaned wet which perhaps explains why the grandfather of the faded Daguerrotype wore pants at ankle length.

Volatile organics fill legitimate needs. Mankind is generally better with them than without. They are not superfluous creations of an establishment intent on profiting from the artificial needs it creates. I will admit though, that the benefits to mankind of nail polish are rather intangible.

TABLE I Products in Public Use Containing Volatile Organics

	Main Volatile Organic Components
Fuels	
Regular gasoline	ANoa hydrocarbons*
Unleaded gasoline	ANoA hydrocarbons 30-45% toluene
Lighter fluids	Ana hydrocarbons
BBQ starter fluids	ANA hydrocarbons
Campstove fluids	Ana hydrocarbons
Automotive	
Windshield antifreeze	Methanol, isopropanol
Gas line antifreeze	Methanol
*Cleaning Fluids***	
Suede cleaners	Perchloroethylene, 1,1,1-trichloroethane
General use cleaners	Ana hydrocarbons, varsol***
Degreasers	Trichloroethylene
Typewriter cleaners	1,1,1-trichloroethane, xylene
Floor wax cleaners	Ana hydrocarbons
Upholstery cleaners	Perchloroethylene
Window cleaners	Isopropanol, methanol
Typewriter correcting fluids and thinners	Toluene and/or trichloroethylene, xylene
Household - Other Than Cleaners	
Waxes	Ana hydrocarbons
Furniture polish	Ana hydrocarbons
Shoe polish	" "
Frying pan coatings	" "
Slipping agents (windows/drawers)	" "
Shoe water repellent	" "
Nail-polish remover	Acetone, toluene, MEK, ethyl acetate - singly or combined
Masonry water repellents	Ana hydrocarbons

(Table I cont'd.)

Sealants	
Rubber caulks & sealants	ANA hydrocarbons, toluene, xylene
Windshield sealers	ANA hydrocarbons
Toiletries & Drug Store Available Items	
Perfumes, colognes, lotions	Alcohols - mostly ethyl
Rubbing alcohol	See denatured alcohol
Methyl hydrate	See denatured alcohol
Cough Syrup	Some contain chloroform
Acetone	Available as 100% pure from drug stores
Liniments	Alcohols
Adhesives and Fillers	
Household, model cements	Tetrahydrofuran, acetone, MEK, toluene, ethyl acetate singly or combined
Contact cements	Ketones, ethyl acetate, ANA hydrocarbons, toluene, usually blends of these
Water resistant ceramic tile adhesives	Ana hydrocarbons
Plastic wood	Ethyl acetate, ketones, ANA hydrocarbons, toluene
Paper cement	Ana hydrocarbons
Tire lube repair adhesive	Ana hydrocarbons
Water based contact cements	Some contain toluene used emulsification of the components
Tubed adhesives, fillers & sealers, e.g. plastic aluminum, gasket sealers, etc.	Ketones, ANA hydrocarbons tetrahydrofuran, toluene
Coatings and Related	
Paints and paint thinners	ANA hydrocarbons, higher aromatics
Wood stains (REZ****)	Ana hydrocarbons

(Table I cont'd.)

Shellac	Alcohols - mostly methyl, ethyl and isopropyl
Lacquers & lacquer thinners	Ketones, esters from methyl to amyl, ANA hydrocarbons glycol-ethers
Paint brush cleaners	ANA hydrocarbons, ketones alcohols
Antiquing kits	ANA hydrocarbons
Clear wood varnishes, urethane & others	Ana hydrocarbons
Danish, teak oils	Ana hydrocarbons
Concrete wall & floor coatings (Resilacrete****)	Ana hydrocarbons, some contain also higher aroma naphthas
Turpentine	Terpenes (cyclic and aromatic)

Paint & Varnish Removers

(a) Non-flammable types are based on methylene chloride as the main ingredient. Other ingredients may be ketones, naphthas, glycol ethers, cyclohexanone, methanol.

(b) Flammable types are based on benzene as one of the main ingredients. Methanol, ketones, glycol ethers, may also be present.

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* The letters ANOA stand for Aliphatic, Naphthenic, Olefinic, Aromatic. The upper case letter indicates predominance of one species, the lower case letter indicates the presence of that species in smaller quantities--usually less than 10%. When all components are present in substantial quantities, upper case is used for all. The word hydrocarbon unless qualified is understood to mean substances containing hydrogen and carbon *only*, and should not be used to describe substances such as chlorinated hydrocarbons which contain chlorine unless qualified by the "chlorinated" prefix.

** In this group some products have contained carbon tetrachloride. Although not used in locally available products other products may contain it.

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TABLE II TLV's of Some Organic Volatiles Found in Products Used by the Public[3]

		TLV
A	**Oxygenated**	
	Keytones	
	Acetone	1000
	Methyl Ethyl Ketone	200
	Methyl Isobutyl Ketone	100
	Esters	
	Methyl Acetate	200
	Ethyl Acetate	400
	Isopropyl Acetate	250
	Butyl Acetate	200
	Amyl Acetate	100
	Alcohols	
	Methyl	200
	Ethyl	1000
	Isopropyl	400
	Butyl	100
	Amyl	100
	Glycol Ethers	
	2 Ethoxy Ethanol	100
	Ethoxy Ethyl Acetate	100
B	**Hydrocarbons**	
	Aliphatics	
	Hexane	500
	Heptane	500
	No specific figures available on specific aliphatics of other molecular weights and structure.	
	Naphthenics	
	Cyclohexane	300
	Methyl Cyclohexane	500

	Aromatics	
	Toluene	100
	Xylene	100
	Turpentine	100
	*Naphthas**	100-400
C	**Chlorinated**	
	Methylene Chloride	500
	1,1,1 Trichloroethane	350
	Trichloroethylene	100
	Perchloroethylene	100
	Ethylene Dichloride	50
D	**Nitrogen Containing**	
	Nitromethane	100
E	**Sulphur Containing**	
	Tetrahydrofuran	100

---

* The word naphtha describes any of several ANA blends in which the aliphatic component predominates. A typical aliphatic naphtha may consist of 70% aliphatics, 20% naphthenics, 10% aromatics. Boiling points vary according to grades. An aromatic naphtha may contain 70-90% aromatics.

Notes on Tables I and II

(a) V.O.'s listed for the products shown are the ones which on the experience of this writer are more likely to be contained, but it is quite possible for these products to contain other V.O.'s.

(b) V.O. producers and those who use them in their products require materials of constant performance. The degree of purity required of any one V.O. depends on the performance objective. For these reasons many volatiles are purchased as blends as these offer adequate performance at lower price. These blends may contain several chemicals which are there because of the way that the main substance is derived, and not because they have been added deliberately. This is particularly true of naphthas which are shown by gas chromatography to contain two dozen or more individual kinds of molecules. The same applies to a lesser degree to alcohols and esters. It is important to stress this for the benefit of those conducting clinical studies.

(c) The word "naphtha" is used to describe a hydrocarbon-only blend. These blends are either aliphatic prevailing or aromatic prevailing with the naphthenics fitting where they may. Aliphatic naphthas contain mostly aliphatics but all contain naphthenes from 10% to 40% and aromatics from 2% to 10%. The molecular species may be of any assortment of straight chain/branched molecules within a molecular weight which fits the distillation points given for the given volatile. Aromatic naphthas are usually blends of high boiling point fractions containing xylene and higher molecular weight aromatics.

In order of toxicity naphthenes are more or less as toxic as aliphatics, but both are less toxic than aromatics. Aliphatics, naphthenics and aromatics of C_6 and C_7 types compare as follows: (For an explanation of TLV's see page 13)

C_6 Hydrocarbons	TLV	*C_7 Hydrocarbons*	TLV
Hexane	500	Heptane	500
Cyclohexane	300	Methyl cyclohexane	500
Benzene	10	Toluene	100

Because of the way in which TLV's are obtained (see page 13), these numbers do not have the mathematical certainty that is usual in non-living systems. Large differences are nonetheless indicative of different toxicities, i.e. benzene and toluene. Benzene's TLV may be reviewed downward on account of cancer-related toxicity.

(d) Highly toxic additives in spite of their very low volatility can lead to poisoning by inhalation. This is the case with tetraethyl lead. This apparent anomaly may be explained by the method commonly used for gasoline abuse which is to bring a rag to the mouth, and by the potent toxicity of tetraethyl lead in small quantities. One may surmise, with no clinical evidence to support this, that the rag in bag method would be less conducive to lead poisoning than the rag in the mouth method.

(e) Aerosols are not listed as these are not considered in this presentation.

(f) Gasoline. From the 1940's onward gasoline has been involved in many cases of volatile abuse. In 1976, most of the cases reported to the poison control centers involved gasoline. While gasoline has not generally been in the most wanted list, it is appropriate that we should review the chemical composition of gasoline.

Gasoline consists mainly of hydrocarbons and a very small percent of additives such as antioxidants. Some grades may include octane boosters such as tetraethyl lead and performance boosters such as tricresyl phosphate. The antioxidants are alkyl-phenols which are not volatile and are used in tiny quantities (less than 0.01%). The tetraethyl lead and the tricresyl phosphate are essentially non-volatile substances. In spite of this lesser volatility tetraethyl lead is also inhaled along with the other components. Cases of lead poisoning of gasoline sniffers have been reported. Gasoline sniffing has reportedly reached epidemic proportions among Indian children in Manitoba.

The hydrocarbon composition of gasoline varies so widely that it is more proper to speak of gasolines than of "gasoline." These hydrocarbons comprise (1) the saturated or *aliphatic* family. Highly volatile materials

as butane and pentane are usually present during winter months. Butane is normally a gas at room temperature. It and pentane are the tigers in your tank of bygone days. (2) *Naphthenes* or saturated cyclic hydrocarbons are also present as well as (3) *olefins* in smaller quantities. Finally (4) *aromatics* such as benzene, toluene, and higher homologs. These hydrocarbons are present in various degrees of molecular weights and branching, a veritable maze of substances that varies according to: (a) feed stock, (b) processing, (c) grade, (d) region, (e) time of year. This is all possible because producers sell performance not composition, and gasolines of different composition can have equal performance.

For those conducting clinical studies this poses the problem of relating the effects of volatile abuse with volatiles abused--the volatiles in gasoline can by no means be considered constant.

Lead Out - Toluene In

The phasing out of tetraethyl lead has put gasoline producers to the task of finding alternate methods of retaining the octane rating. Manganese compounds have been used but according to recent reports these too have their drawbacks. The most widely adopted method of increasing the octane rating has been to add toluene.

According to information from industry, toluene contents in unleaded gasoline average about 29% with regional variances. In some gasolines the toluene content may reach about 45%.

Why Volatile Organics

Let us consider this question in two parts.

A. *Why Volatiles* The degree of volatility is intimately related to the use of the product. In a shoe shine the V.O. should be dry on the first shoe once polish has been applied to the second. A floor lacquer that dries in one hour allows doing the whole house in one day--two coats. To a workman, a contact cement that dries in 10 minutes means that he does not have to wait one hour to go on with the job--as with Latex contact cements. The fact that V.O.'s can be so much faster drying than water is of great value in many cases. Volatility *is* related to abuse for the following reasons:

   1. Practical reasons to do with method of use.

   2. Biological reasons. The medical view is that to be an inhaled intoxicant a substance must be carried by the blood cells to the brain. For this to be possible the intoxicant must diffuse through the lipid layer or be picked up by ionization. Small molecules diffuse more easily than large ones and are also more volatile.

B. *Why Organics* The substances which make up most coatings and adhesives are organic. Dirt is often organic. The only liquids that dissolve all the above are organic. Superficially the above seems to imply that volatility is a convenience and the "organic" part is a necessity. This is not so. The best solvents for the organic component of an adhesive or a coating are the smaller molecules which happen to be the more volatile.

How Safe Are Volatile Organics

The substances of our concern can be inhaled safely day after day up to a certain concentration of volatility in air. The figures given in Table II called Threshold Limit Values or TLV are these limits. TLV's:

(a) provide a criteria to the chemist who formulates products for the public and must reckon with their hazards to workers and to the public;

(b) relate to the legitimate use of the product and its safety;

(c) provide to the layman a basis for comparison with substances that are more familiar.

It should be emphasized that TLV's *do not* relate to abuse. Volatile addicts expose themselves to concentrations that are up to 1000 times as great as the TLV of some of these VO.'s (2). Because the derivation of TLV's is totally unrelated to these extreme concentrations no extrapolation should be attempted (1). The effects of abuse for this reason can be, and are, quite different for any two substances with equal TLV's.

The American Conference of Governmental and Industrial Hygenists (3) explains TLV's as follows:

The Threshold Limit Values refer to air-borne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse affect. Because of wide variation in individual susceptibility however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit, a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness.

Threshold limit values refer to time-weighted concentrations for a seven or eight-hour workday and 40-hour workweek. They should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations. (Exceptions are the substances...designated with a "C" or Ceiling value....)

The amount by which these concentrations may be exceeded for short periods without injury to health depends on a number of factors such as the nature of the contaminant, whether very high concentrations even for short periods produce acute poisoning, whether the effects are cumulative, the frequency with which high concentrations occur, and the duration of such periods. All must be taken into consideration in arriving at a decision as to whether a hazardous condition exists.

Threshold limits are based on the best available information from industrial experience, from experimental human and animal studies, and when possible, from a

combination of the three. The basis on which the values are established may differ from substance to substance: protection against impairment of health may be the guiding factor for some, whereas reasonable freedom from irritation, narcosis, nuisance, or other forms of stress may dominate the basis for others. The Committee holds to the opinion that limits based on physical irritation should be no less binding than those based on physical impairment; growing bodies of evidence indicate that physical irritation may promote and accelerate physical impairment.

Some threshold limit values are based on discomfort from irritating effects of solvent vapors and they are well below concentrations considered injurious. Acetic anhydride is an example. Its vapor is strongly irritating and workers may be exposed to slightly higher concentrations than the five ppm threshold limit without serious consequences or the danger of cumulative effects, although they would be extremely uncomfortable. However, the opposite is true of 1,1,2,2,-tetrachlorethane, which also has a threshold limit of five ppm. This is an extremely toxic solvent and its odor and irritating properties do not serve as adequate warning of excessive exposures. While workers can tolerate higher concentrations than five ppm without discomfort, the vapors are highly toxic. The threshold limit is based on industrial poisoning experience.

Strongly irritating solvents frequently have their own warning properties, and workers cannot work without extreme discomfort in a concentration that would be harmful.

It should be remembered that the toxicity of a solvent usually depends on its physiological response within the subject rather than on its odor. The odor thresholds for most solvents vary widely from person to person, and they should not be accepted as reliable guides to distinguish between the safe and the unsafe concentrations.

It is to be emphasized that threshold limits should serve only as a guide for good practice and they should be applied and interpreted by competent individuals who have a complete understanding of the basis on which they are determined, and their limitations.

The volatile organics of Table II have TLV's ranging from 1000 for acetone and ethanol, to 100 for turpentine and toluene.

To relate the TLV's of volatile organics such as are used in the products of Table II with the more familiar volatile organics such as are used at the dinner table, consider the case of vinegar.

Vinegar contains up to 8% acetic acid, a volatile organic with TLV of 10. Its human toxicity according to the Merck Index (8) is as follows:

> *Human Toxicity: Ingestion may cause severe corrosion of mouth and G.I. tract, with vomiting, hematemesis, diarrhea, circulatory collapse, uremia, death. Chronic exposure may cause erosion of dental enamel, bronchitis, eye irritation.*

It is very strong stuff indeed but it does not prevent us from enjoying a little vinegar with the salad. The very fact that we can do it with impunity illustrates in a dramatic way the significance of concentration in assessing the hazards of chemicals. Should we choose to ignore the matter of concentration we could be poisoned by things we eat regularly such as mustard and salt.

One could even conceive a press release which might state quite correctly that "It has been learned of late that vinegar manufacturers have been putting in their product a dangerous chemical known to cause circulatory collapse, uremia, and death. We urge consumer groups and all concerned responsible citizens to write to your member of parliament and petition that this dangerous and irresponsible practice be stopped, that vinegar should be removed from the shelves and that those responsible should be brought to justice."

Another useful comparison comes from considering turpentine and toluene. Turpentine consists of terpenes which are the substances which give pine forests their delightful scent. Turpentine has been in use now for generations and has been for a long time a household word. Yet, turpentine has a TLV of 100 which is identical to that of toluene. This does not mean that it is unhealthy to take a walk in the forest, for the amount of terpenes in the air would be considerably below the TLV, but it illustrates once again the importance of concentration.

Industrial Handling of Volatile Organics

The proper, safe handling of volatiles requires above all adequate ventilation and careful handling to prevent exposures of workers to injurious concentrations and to avoid the build-up of vapors in the air which would constitute a fire hazard. In a modern adhesives plant there should be no need for open vessel processing of highly volatile materials but if such cannot be avoided, low point ventilation should be provided so that the heavier than air vapors are removed.

Our plant handles a good many of the volatiles listed in Table II and although we have no means of knowing how typical our plant is, we have no reason to believe that our case histories regarding the attitudes of our workers towards solvents are in any way unique. Our workers have unrestricted access to all volatiles they handle. Misuse by inhalation has been almost unheard of and this is not because of impediments, threats, or warnings. It is possible for a worker to become momentarily exposed to uncomfortable levels but then the instinctive reaction is to seek relief by taking a breath of fresh air, closing a vessel, etc.

Contrary to what a person that has had exposure to thrill-seeking abusers might suspect, to the worker in plant or laboratory the volatiles they handle hold as much appeal as a headache. It will probably be a disappointment to those who hope to learn from the industrial example about preventative measures and methods of control that industry has very little to offer.

There is a certain tendency to regard alcohol and V.O.'s used as "inhaled" intoxicants as if they were in the same class, and one just as appealing as the other. The industrial example shows that they are not. Alcohol would be very much abused in industry if it was not controlled there.

The other V.O.'s in industry are neither restricted nor abused. As industrial workers are not biologically different from people on the outside, if the truism is excused, one cannot but conclude that the industrial worker is separated from the volatile abuser by a psychological and sociological gulf.

Alternatives to Volatile Organics

There are four kinds of products in public use containing volatile organics.

1) *Fuels:* As long as gasoline lasts it will be a plentiful source of intoxicant of ready availability. The high content of toluene made necessary by the lead phase-out may cause unsuspected problems. There is no likelihood that denaturing can be technically feasible or practical.

2) *Cleaning Fluids:* There are no substances known that can replace effectively the ones now in use. Cleaning fluids are here to stay as they are, until new compositions of matter are developed or until we are prepared to live with dirt or change it.

3) *Coatings:* Latex coatings have replaced solvents in many applications. In others, solvent-containing coatings are still widely used. Some coatings must be water-free such as clear wood lacquers and varnishes because of the adverse effect of water on wood. Latex based coatings are otherwise used within their limitations.

4) *Adhesives:* They are a far more complex case: Very basically *an adhesive* is a spreadable substance which is capable after being placed between two surfaces, of undergoing a transformation from the spreadable, fluid state to the solid state in which state it possesses the properties of adhesion and cohesion.

In practice, adhesives have to fulfil many requirements which is the reason so many adhesives have to be made available. There are essentially six categories of adhesives in public use and four others in industrial use, according to the mechanism by which they set. Of the six, one contains solvents, the other five are solvent free. The five mechanisms (categories) are:

i) evaporation of water where water is present as a solvent (mucilage);

ii) evaporation of water where water is present as the emulsifying medium (P.V.Ac);

iii) reaction of reactants in aqueous solution and simultaneous evaporation of water (urea formaldehyde, resorcinol);

iv) reaction and polymerization between two solvent-free liquid reactants (epoxies);

v) reaction of monomeric reactant with atmospheric moisture and subsequent polymerization (cyanoacrylates, silicones).

These five volatile-organic-free techniques represent all techniques by which volatile organic free adhesives *for the public* can be made. Quite obviously, had it been possible to satisfy all public requirements by these means alone, solvent based products would have been redundant. The reason this has not happened is because it is not possible by these technqiues alone to furnish the public with products that fulfil *all* its requirements.

These five techniques have limitations which arise from the multiplicity of requirements. Some of these requirements result from a single factor but more often from a combination of factors a few of which are:

(a) The need for a volatile organic to dissolve the surface being bonded, as in a plastic model. The alternative here, which calls for a fast setting adhesive would be a cyanoacrylate but as is well known, cyanoacrylates on account of their fast setting properties and likelihood of skin bonding, should not be handled by children.

(b) The limited bonding range of adhesives generally. Solvent-free adhesives, e.g. epoxies, do not bond well some plastics. There are some epoxies specifically available for bonding specific plastics but with the many plastics available the general public would gain very little from the confusing proliferation that would result should such specialties be made available, and the retailer would be left with such products on the shelves, assuming that he would have been foolish enough to put them there in the first place. If the application involved a vinyl plastic, the Canadian public knows that all they have to do is to buy a small tube of easy-to-use household cement which bonds plastics like vinyl to itself, metals, glass, etc.

(c) The unwelcome presence of water in many applications, e.g. bonding metal to vinyl.

(d) The poor physical properties obtained from some polymer emulsions: these apply to water based contact cements whose water resistance, strength, and heat resistance are notoriously inferior to that provided by solvent adhesives.

(e) The unsatisfactory bonding requirements of some non-solvent systems. Latex based contact cements for example have a very limited bonding range. They must

be bonded within narrow time limits or delamination may occur. This is usually around 45 minutes to one hour for a total of 15 minutes depending on temperature, etc. Conventional contact adhesives on the other hand have bonding ranges usually from 10 minutes to two hours, for a total of 110 minutes.

(f) The considerably higher cost of non-solvent systems. In the case of contact cements, water based adhesives have been considerably more expensive--about 50% more expensive than conventional ones because of some perversity on the part of colloid chemistry which requires that these emulsions be made at higher solids than are economical or than can be used to advantage. Lower solids require the presence of high levels of non-active ingredients (emulsifiers) which further detract from the overall bonding properties. For these and other reasons too lengthy to go into further detail, the public in this country have cast their negative vote against water-based contact cements. Admittedly these products constitute but one example among many but the reasons are too diverse and numerous to permit further amplification.

The range of techniques available to maker and user of coatings and adhesives for industry is consequently greater in industrial use, where there are many other techniques that may be applied to bring about the conversion of the liquid to the solid. These include:

(a) liquation of the solid by heat and subsequent cooling--hot melts, fluid beds

(b) ultrasonic induced polymerization of a monomer

(c) radiation induced polymerization

(d) U.V. light.

Such techniques needless to say, are beyond the scope of the general public.

The successful replacement of existing with V.O. free products depends quite basically on new compositions of matter being created. This is a subject of intensive research in laboratories around the world. Because of the colossal costs that are usually involved such research has been confined to the giants of the chemical industry. As new

materials become available, our industry will use them to make better and safer products as the record of our industry amply demonstrates.

Can Volatiles Be Made Abuse Proof - Alcohol Denaturants

Denaturants are substances added in relatively small quantities to another substance whose misuse is to be prevented. Every time the problem of volatile misuse has arisen, the idea of the denaturant has appeared to many to offer the instant solution. It is appropriate then that we consider the case of denaturants from a different angle, namely the prevention of alcohol misuse.

In the United States and Canada, two countries where denaturants are required by law, the denaturants that may be used in alcohol for industrial use are chosen from a list supplied by the Internal Revenue Service or Her Majesty's Department of Internal Revenue respectively.

To those of us who have studied these lists with expectation of finding a safe denaturant for those of our products that contain toluene, ethyl acetate, acetone, etc., it has been a surprise to find that the substances added to prevent alcohol abuse are toluene, ethyl acetate, acetone, etc! The U.S. list goes further yet. It approves the addition of phenol. The thinking at the venerable institutions must have been that alcohol abuse is so evil that the perpetrators deserve to be poisoned!

If we discount the number of people who have been blinded by drinking denatured alcohol or otherwise injured, this approach must rate as a success. Whatever success it may have had again underlies the difference between the average man and the intoxicant inhaler.

Other Denaturants

The idea of the denaturant seemed to have merit borrowing from the "success" of the "pasteurization" of alcohol. Hundreds of denaturants among a vile list of lachrymants, nauseants, irritants, and foul smelling substances have been considered. After realizing that legitimate users were as likely to be hurt by these as the addict by his abuses, the

idea has lost appeal. While the search still carried on, a producer made the announcement to the press that he had found the long sought, safe, denaturant.

Allyl Isothiocyanate

Allyl isothiocyanate was widely publicized around 1968 as the answer to the abuse of hobby cements. Allyl isothiocyanate had come along with excellent credentials. It was an authorized meat additive, and besides what could be wrong with a substance contained in a product found at the dinner table for generations? Many legislatures reacted quickly making it mandatory to add allyl isothiocyanate to all hobby cements. It was even considered for addition to all other adhesives. It was then that allyl isothiocyanate was studied in some depth. The results:

(a) Allyl isothiocyanate decomposed in all adhesives in periods varying from several days to several months after which its presence could not be detected (4).

(b) Information was uncovered that allyl isothiocyanate causes cancer in rats (5).

(c) Heavy mustard consumers are reported to be prone to coronary thrombosis (6), the culprit: allyl isothiocyanate.

(d) In contact with acids or heated it releases highly toxic cyanide fumes (7).

It is now evident that the measures taken to combat volatile abuse were based on the semantic misunderstanding that volatile abuse = glue sniffing. It is then no surprise that the scrutiny of oil of mustard for safety and efficacy was perfunctory. Volatile abuse has of course continued in spite of the legislation, and its false promises of instant solutions.

Canadian Consumption of Volatiles in Products in Public Use

While precise statistics are not available for all volatile organics of Table II, the statistics found in Table III should help social workers relate the number of incidents to actual consumption (see page 22).

Table III was prepared from the latest figures available from several producers and as they pertain to the various

TABLE III Canadian Consumption of Volatile Organics Found in Publicly Available Products

ANA[2] Hydrocarbons - Gasoline

Yearly Consumption	Millions of Imperial Gallons	
Gasoline - all types	8,000	(1976)
Unleaded gasoline	2,400	(1976)
Toluene* in unleaded gasoline	720	(1976)

ANA[2] Hydrocarbons in Products Other Than Gasoline

Product	Volatiles Millions of Imperial Gallons-1976		
	Aliphatic/ Naphthenic	Aromatics	Total
Adhesives	3.1	0.4	3.5
Paints/Coatings	8.5	7.5	16.0
Cleaners/Degreasers	6.3	-**	6.3
Fuels	1.0	-**	1.0
Miscellaneous	8.7	0.7	9.4
		Total:	36.2

	Millions of Imperial Gallons			
	Adhesives	Coatings	Misc.	Total
Acetone	0.2	0.5	--	0.7
Methyl Ethyl Ketone	0.17	0.3	--	0.47
Methyl Isobutyl Ketone	--	0.25	--	0.25
Methanol	--	--	3	3
Isopropanol	--	0.56	0.4	4.56

* Based on an estimated 30% average.
**Blends of ANA Hydrocarbons reported as non-aromatic usually contain up to about 10% aromatics but are reported as aliphatic and sold as such.

TABLE IV Evaporation Rate of Some Volatile Organics in Public Use

As measured by the Shell Thin Film Evapormeter @ 25°C and 0° Relative Humidity. Publication of Shell Oil Company.

	Seconds to 90% Evaporation	
Water	1287	Times faster than water
Hexane	52	24.0
Acetone	82	16.0
Tetrahydrofuran	97	13.0
Ethyl Acetate	115	11.0
Methyl Ethyl Ketone	121	10.6
Isopropyl Acetate	134	9.6
Methyl Alcohol	221	5.9
Toluene	240	5.3
Methyl Isobutyl Ketone	282	4.6
Ethyl Alcohol (anhydrous)	287	4.5
Isopropyl Alcohol	319	4.0
Nitromethane	361	3.6
N-Butyl Acetate	458	2.8
N-Amyl Acetate	689	1.9
Xylene	820	1.6

industrial sectors, are believed to be accurate. However, as the figures obtained do not separate the end use, i.e. industrial vs public, the assumption was made on a rule of thumb basis that public consumption would be approximately on a 30/70 ratio vs industrial. Those that know differently may thus arrive at their own correct figures.

These figures show that about 400,000 gallons of aromatics were used by the adhesive industry in products for public use: 200,000 gallons of acetone; approximately the same volume of methyl ethyl ketone; and some 3,000,000 imperial gallons of mostly aliphatic hydrocarbons. By comparison, cleaners and degreasers consumed some 6,000,000 gallons of aliphatics. The amount of toluene that went into unleaded gasoline, based on an average of 30%, came to over 700 million gallons.

The consumption of volatile organics in the U.S. may be 12 or so times greater than that of Canadian consumption.

Although the consumption of volatile organics in the manufacture of products for the public sector is minuscule by environmental standards, incidents of volatile abuse are in proportion to volumes of volatiles used even smaller.

Conclusion

Volatile organics are contained in hundreds of products: fuels, polishes, cleaning fluids, adhesives, and coatings. They are useful substances, essential to the fulfilment of legitimate needs of everyday life. They are all psychoactive and are toxic at the concentration levels that intoxication addicts subject themselves to. Many of these volatiles have been used in the prevention of alcohol abuse; the fact that a few people would abuse even these "abuse preventers" illustrates the psychological and sociological gap that separates the volatile abuser from the rest of society.

Universal "denaturing" of all volatiles and the products that contain them is neither safe, nor practical, nor technically possible. It creates more problems than it solves.

Labeling benefits only the legitimate user and in this regard Canada has already taken an avant-garde position. No instant solution can be expected from industry or legislation.

We are left with one alternative: that of quietly, patiently, and persistently removing the social factors that cause or encourage volatile abuse.

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AEROSOL PRODUCT SAFETY

by James Wega

Product safety concerns everyone who is involved with the marketing of consumer products. I hope this discussion will bring to light some of the various aspects of product safety related to aerosol products.

There are five categories in this paper: (1) environmental concerns--specifically, the fluorocarbon/ozone issue; (2) flammability; (3) explosiveness; (4) inhalation; and (5) abuse.

The Fluorocarbon/Ozone Issue

In 1974, a theory was put forth by two California scientists, Drs. Roland and Molina, based on a one-dimensional computer model. The hypothesis was that fluorocarbons would drift to the ozone layer 15 miles up, and there might be a breakdown of ozone causing a greater percentage of ultraviolet light to reach ground level causing effects on climate and human health.

Mr. Wega is vice president and technical director of Conn Chem Ltd., the largest custom aerosol manufacturer in Canada. He is currently director and aerosol divisional chairman of the Canadian Manufacturers of Chemical Specialties Association. Mr. Wega is a member of the Chemical Institute of Canada and chairman of the Canadian Aerosol Information Bureau, which is located in Ottawa, Ontario.

Since 1974, a lot of research has been done and it still remains a theory; however, the Canadian government was sufficiently concerned that the Minister of the Environment, The Honourable Romeo LeBlanc, in December 1976, indicated that, through discussions with the industry, there has been a voluntary agreement to phase down fluorocarbon consumption in aerosol products by 50% during 1977 and phase out 'non-essential' aerosols containing fluorocarbons (currently defined as hair spray, antiperspirant, and underarm deodorant) during 1978.

The following comments provide some perspective on the Canadian use of fluorocarbons in aerosol products:

(a) Less than 20% of aerosol products on the market use fluorocarbon propellants. They are primarily used in personal products such as hair spray and underarm deodorants. The Canadian government regards these products as 'non-essential' and fluorocarbons will be phased out of these 'non-essentials' during 1978.

(b) Personal products such as hair spray and underarm deodorants are presently being converted to non-fluorocarbon propellents.

(c) The greatest percentage of aerosol products on the market today are not part of this fluorocarbon/ozone issue. For years, such products as shaving cream, paint, room deodorants, disinfectants, and pesticides have used non-fluorocarbon propellents.

(d) For a point of perspective, Canada uses 2% of the fluorocarbons manufactured in the world today: 1% is used in aerosol products and 1% is used in other industries such as air conditioning, refrigeration, and blowing agents (for example, polyurethane foam which is used in building insulation).

Flammability

In 1969, the Department of Consumer & Corporate Affairs amended the Consumer Packaging and Labelling Act. One of the amendments incorporated test methods for checking the flammability of aerosol products. If an aerosol product had potential flammability (based on the results of these

test methods), then appropriate flammability symbols and cautionary statements were to be placed on the label.

At the time of the amendment to the regulation, there was a realization of potential flammability but it was not substantiated statistically. Recent conversations with Consumer and Corporate Affairs indicate the situation has not changed. For the past seven years, consumers have been additionally informed about the potential flammability by the use of flammability symbols and cautionary statements for aerosol and non-aerosol consumer products, and it appears that consumers are using common sense in handling aerosol products that could be potentially harmful. This has been further substantiated by the U.S. Consumer Product Safety Commission (CPSC) studies indicating that aerosol packaging has been involved in an 'infinitesimally' small number of home accidents.

Explosiveness

Similar to flammability, there have been some misconceptions about the explosiveness of aerosol products. As with flammability, the Hazardous Product Regulations were amended to incorporate the explosive symbol. Again the incidences are very small. There is only a hazard when aerosols are abused and used contrary to the directions on the label. There is additional information by the U.S. CPSC stating, "...none of the CPSC tests reflected in the in-depth reports show true explosion under normal use...." In Canada, there are the Canadian Transport Commission (CTC) regulations where aerosol containers have to be passed through a hot water bath (with a bath temperature of 55-65 degrees C) to check for container integrity. As you may have noticed, there is a cautionary statement on the label indicating not to expose to temperatures above 50 degrees C (120 degrees F).

What About Inhaling Aerosols?

There have been extensive studies on the propellants. Some of these studies done on propellents and ingredients used in aerosol products include the following:

Is there an effect when humans are exposed to one, two and eight hours of varying concentrations of fluorocarbon propellents? Dr. R. Stewart of the Medical College of Wisconsin conducted a study and the results indicated no effect at exposure levels of 1000 ppm. This level is equal to the Occupational Safety and Health Act standard for occupational exposure. This working standard is for a prolonged period: eight hours a day, five days a week for a year.

Are any chemicals (metabolites) formed by breathing in propellent? Dr. D. Blake of Johns Hopkins University conducted studies on humans and animals. No metabolites were identified and there appears to be no long-term storage of gases in the organs or fluids of the body.

Are there any reversible and irreversible effects upon the heart? Dr. N. Flowers of the Medical College of Georgia found none unless deliberately abused. Fluorocarbon II had its initial effects upon the heart at 140,000 ppm and irreversible effect at 180,000 ppm. Fluorocarbon 12 had no effect on the heart beat even at concentrations as high as 800,000 ppm. These levels far exceed the OSHA maximum of 1,000 ppm and still further exceed the amount of propellent released in the normal use of an aerosol product, that is, about 100 ppm.

Do fluorocarbons affect the ability of the lungs to rid themselves of bacteria? Dr. G. Laurenzi of the Respiratory Disease Research Laboratory found no effect on the lung's ability to clear both gram positive and negative bacteria.

Do propellents affect the upper respiratory system defense mechanism? Dr. R. Albert of New York University found no effect upon tracheobronchial mucociliary clearance rates.

What about the other ingredients in the container? For example, what about hair dressers who are exposed to relatively high levels of hair sprays? Studies indicate that the propellents are safe when used according to directions. The study of health of hair dressers by Dr. D. Discher of the University of Washington Medical School has just recently been completed. The research involved collecting cardiorespiratory health data from hair dressers and comparing this data with sex, age, and smoking history. The report appears to show no apparent adverse findings. This two-year study is in its final draft stage. Two experts reviewing the research

disagreed on statistical interpretations of certain slides but explained that it doesn't affect the health significance of the study.

Bio-Research Laboratories in Montreal conducted a Canadian study in 1973 for the Department of National Health & Welfare (sponsored by the Canadian Manufacturers of Chemical Specialties Association) on blood fluorocarbon levels following exposure to a variety of household aerosols. Twenty housewives were exposed to a variety of aerosols (deodorant, hair spray, frying pan spray, room freshener, insect repellent, furniture polish, spot remover, wall cleaner, depilatory and bathroom cleaner) at 10 times the normal usage. Part of the conclusion read, "It appears very unlikely that under normal conditions of use in relatively non-enclosed areas such as encountered in houses, aerosol users may be exposed to such high concentrations required to provide evidence of toxicity...we may also say from the experience gained in our study that if we have found no significant evidence of toxicity from the propellents after the intensive use of aerosols made by our subjects, we have also found no manifest untoward effects from the active ingredients...."

My comments do not include the extensive toxicological studies done by manufacturers for the many product categories. Due to the fluorocarbon/ozone issue, there are changes to non-fluorocarbon propellents such as hydrocarbons. Fluorocarbons have a low order of toxicity and the substitution of non-fluorocarbons such as hydrocarbons have even a lower order of toxicity.

In summary, studies to date have clearly indicated that under normal use conditions, propellents are safe. There are plans to re-evaluate the safety of additional propellent systems and ingredients sprayed from aerosol containers. In the U.S., generic formulae for a number of aerosol product types have already been developed which will be useful to both industry and government in planning these future studies.

Recently, I read an article in the *Toronto Star* with the headline "Spray deodorants may be harmful." This was a summary of a paper delivered by Dr. Cavender at the Toronto meeting of the Society of Toxicology. My colleagues and I were concerned when we read it and contacted

Dr. Giovacchini, one of the leading toxicologists particularly in the area of antiperspirant toxicology. He indicated that this study is presently being evaluated and indicated to me that there was some concern about dosage levels. Apparently, the dosage of antiperspirant given to the rats was equivalent to spraying antiperspirant into a bathroom until you couldn't see the mirror, remaining in the mist-laden room for one year, and then finding that you have lung irritation. It's a case of interpreting the data of high dosage to normal usage.

What About Aerosol Abuse?

Unfortunately, in Canada, there have been three known fatalities caused by aerosol sniffing. All were youths with a history of sniffing and who had used the product to attain a high. The most recent one was one-and-a-half years ago in Toronto. There were allegations by Dr. Fagan, a Toronto pathologist, that the product was lethal. Based on these allegations, the manufacturer of the product had Bio-Research Laboratories in Montreal conduct a study. The results of that research duplicated as much as possible the studies done by Dr. Fagan and they showed no lethal effects of the kind noted by the Toronto doctor.

This study was forwarded to the Health Protection Branch of the Department of National Health and Welfare and the Department considered the Bio-Research study to be sound and re-affirmed that the product is harmless unless abused.

Although I cannot speak for U.S. statistics and the magnitude of aerosol sniffing in the United States, aerosol sniffing in Canada is not a problem.

In conclusion, the aerosol track record on safety is good. Research to date indicates that the safety range is tremendous in normal use. Most or all of the few accidents could have been avoided if the user had followed the label directions on the container. The following are simple precautionary measures.

1. Read the directions and warnings on the label and follow them.
2. Do not puncture the can.
3. Do not throw empties into incinerators.

4. When the product is used up, release as much pressure as possible by pressing the actuator.

5. Never place an aerosol on a hot stove, near a furnace, radiator, or any other location where the temperature may be raised above 50 degrees C (120 degrees F).

6. When using spray suntan preparations at the beach or pool, protect them from the heat of the sun.

7. Do not leave aerosol products in a closed car or trunk.

8. Never spray near flames, including a pilot light on the stove.

9. Do not smoke while using aerosol products.

10. Never aim spray at face, eyes, or mucous membrances.

11. Avoid breathing vapors.

12. With personal products, be sure to follow directions and spray at the indicated distance from the body.

13. Keep aerosol products out of reach of small children.

INHALING INTOXICANTS: HISTORICAL, BIOLOGICAL, AND SOCIAL PERSPECTIVES

by Douglas Chaudron

The inhalation of intoxicants--best known in its "glue-sniffing" variety--is a notable, though small, aspect of the drug misuse problem in North America. It is the purpose of this brief overview to acquaint the reader with the current situation by looking at it from historical, biological, and social perspectives.

Historical

Though the recreational inhalation of gaseous and volatile substances seems very much a modern phenomena, in fact reports of such behavior date back to the beginnings of western civilization. The Greeks are reported to have inhaled gases for religious purposes (Brecher, 1972; NCDAI, 1974), and Brecher (1972) mentions a biblical reference (Proverbs 27:9).

The "modern era" in the recreational use of gaseous substances seems to have begun in the late 18th century

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with the discovery by Priestly of nitrous oxide (Cohen and Dripps, 1970). H. Davey announced its medical use as an anesthetic in 1799 after years of recreational use (Nagle, 1968). The use of nitrous oxide and related substances was known to be popular among medical students in the mid-1800s (Nagle, 1968). One young medical student became interested in marketing the drug, and dropped out of school to tour the country giving demonstrations. His poster in Hartford, Connecticut in 1844 is by now famous:

> *A Grand Exhibition of the effects produced by inhaling Nitrous Oxid, Exhilarating or Laughing Gas! will be given at Union Hall this (Tuesday) Evening, Dec. 10th, 1844.*
>
> *Forty gallons of Gas will be prepared and administered to all in the audience who desire to inhale it.*
>
> *Twelve Young Men have volunteered to inhale the Gas, to commence the entertainment.*
>
> *Eight Strong Men are engaged to occupy the front seats to protect those under the influence of the Gas from injuring themselves or others. This course is adopted that no apprehension of danger may be entertained. Probably no one will attempt to fight.*
>
> *The effect of the Gas is to make those who inhale it either Laugh, Sing, Dance, Speak, or Fight, and so forth, according to the leading trait of their character. They seem to retain consciousness enough not to say or do that which they would have occasion to regret.*
>
> *N.B. - The Gas will be administered only to gentlemen of the first respectability. The object is to make the entertainment in every respect a genteel affair. (Cohen and Dripps, 1970).*

Out of a fight that did occur that night, in spite of the precautions of eight strong men, came a rediscovery of the anesthetic properties of nitrous oxide, and attempts to further its use in medical practice. Ether and chloroform were all introduced into medical practice in the mid-1800s, and no doubt into recreational use as well. Ether had widespread use as an intoxicant in Ireland in the later 1800s, as a substitute drug during periods of success for Ireland's alcohol temperance movement (Brecher, 1972). The turn of the century found a Harvard psychologist, William James, extolling the virtues and values of nitrous oxide inhalation,

foreshadowing the work of another Harvard psychologist, Timothy Leary (Rublowsky, 1974).

The contemporary focus on the inhalation of gaseous intoxicants dates from the late 1950s, when glue-sniffing was reported in the western United States. In the early 1960s there was a flurry of publicity in this area, which Brecher (1972) argues contributed to the popularization of abuse. Current attention is focused on the inhalation of adhesives, solvents, and aerosols by young persons, although use of these substances by other age groups is acknowledged. Canadian studies indicate that no more than a few percent of young people inhale intoxicants with any frequency, and there is a rapid dropoff in use during later adolescence (Commission of Inquiry, 1973).

Biological

Some 23 chemicals in various categories have been implicated in problems of misuse, with toluene in adhesives leading in popularity (Hoffman, 1975). These substances are found in an extensive list of ordinary products including: cleaning solutions, lighter fluid, paint thinners, spot removers, furniture polish, "non-stick" fry pan sprays, fingernail polish and its removers, and numerous other adhesives, solvents, and aerosols. This widespread use and availability inevitably creates complications in attempting to control the use of such substances.

With such a long list of substances involved, it is unavoidable that differences among products will be obscured in discussion. Nevertheless, it is fair to say in general that the inhaled gaseous substances act as depressants of the central nervous system, resembling alcohol in effect. The onset of intoxication is more rapid than with alcohol, due primarily to the more efficient route of administration. The period of intoxication is also typically shorter. Initial subjective effects might include a relaxation, giddiness, and lessening of inhibitions, while prolonged or high dose use might result in a numbing of the senses, or in unconsciousness. Some of the inhaled substances are reported to cause hallucinations, while others do not (Commission of Inquiry, 1973).

Although physiological irritation or damage is sometimes immediately associated with use of certain of the substances in question, the primary dangers in the acute phase of intoxication appear to arise from the user's impairment. Bad judgment and lack of coordination may result in injury to the user. Another way in which impairment produces damage is seen in cases of overdose; numerous overdose deaths have resulted from the user becoming unconscious while still exposed to the gases, with the consequence of respiratory collapse or cardiac failure (Hoffman, 1975).

Continued, or chronic, use of the substances in question can result in a variety of forms of organic impairment. While this impairment may be permanent in some cases (Press and Done, 1967b; Hoffman, 1975), it may be reversible in others (Commission of Inquiry, 1973). It should be noted that most of the information about the effects of chronic exposure result from studies of industrial workers who are exposed for many hours a day, for days at a time. Questions may be raised as to the applicability of these findings to the case of infrequent recreational use. Nevertheless, sufficient risk exists to warrant concern from a public health perspective.

It is apparent that users can develop tolerance to the effects of inhaled intoxicants (Press and Done, 1967a & 1967b) which makes these drugs like virtually all other recreational drugs in this respect. Tolerance leads to the requirement for increased doses to achieve the same effect thereby increasing danger to the user.

Although there is danger in the misuse of inhaled intoxicants, from the physiological point of view the occasional experimental use of some of the gaseous substances does not pose an inevitable danger to the user. But, again like other recreational drugs, public health concerns are focused on the misuser rather than the casual user.

Social

It is virtually universally acknowledged that glue-sniffers and users of other recreational inhalants are typically between the ages of 10 to 15, usually male, and, in the United States, predominantly from minority groups (Brecher, 1972; Commission of Inquiry, 1973; Hoffman, 1975). Although experimental users are probably more widely spread,

chronic misusers are reported to come mainly from lower socio-economic groups, and are more likely to exhibit this as a part of a larger pattern of delinquent behavior. Whether the inhalation of intoxicants is mainly a cause or consequence of delinquent social status in a young person is typically unclear. The usual differences between upper- and lower-class youth with regard to the availability and utilization of health care services and with regard to application of legal penalties would tend to create a distorted picture of drug involvement in this area as in others.

In examining the toxicity of any drug, one may look at social and behavioral, as well as physiological, consequences. As it is a distinctly minority phenomenon among young people, the use of solvents, aerosols, and other gaseous substances may confer a deviant social status on the user where none pre-existed thereby hampering social development. And, as with other drugs of abuse, we can be concerned over the implications of this use for the normal psychological development of the user. If a young person learns to cope with life's demands by resorting to drug use at an early age, how much less likely is it that more mature coping mechanisms will develop?

A further social implication of the misuse of gaseous substances involves the legal status of the user. In the United States, several states or local municipalities have adopted laws to cope with problems of abuse in this area (Brecher, 1972). In Canada, the advertising, sale, and importation of these substances are regulated under the *Hazardous Products Act* and the *Hazardous Products (Hazardous Substances) Regulations*, neither of which limit possession or sale for recreational use. Only in Alberta is recreational use prohibited, under the provincial *Public Health Act.* Elsewhere in Canada, use of gaseous substances might be treated as a problem within the terms of juvenile delinquency legislation.

Conclusion

A survey of the recreational inhalation of intoxicants leads to several conclusions: 1) the use of these substances is not new, 2) nor is it clearly safe or inevitably harmful, and 3) it

will not be easy to reduce. Whereas most drug substances come in relatively few forms, and hence can be singled out for control, inhalable intoxicants come in a bewildering variety of forms, available in a wide range of outlets, and are therefore more resistant to effective "marketing" controls. We may be grateful that these substances do not so far enjoy a more widespread popularity.

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THE COMMUNITY DROP-IN CENTRE

by George Rigg

I would like to begin by quoting excerpts from a letter sent to us by a Tenant Association:

> *We are writing to you on behalf of the Tenant Association regarding problems we have been having with local teenagers. Our non-profit project, owned by the City of Toronto, houses a variety of people, young and old, singles and families.*
>
> *As you may be aware, our project has just undergone an extensive landscaping program which has cost the tenants a great deal of time and money and we are not willing to allow these children to destroy our efforts. The boys and girls congregate on our steps and lawns in gangs of up to 30 individuals.*
>
> *The following is a brief example of some of the specifics we have been encountering. One of our homes had five windows and a door shattered (payment is forthcoming and the charges will then be dropped). Our sidewalks and underneath our cars tires are strewn with glass bottles*

Mr. Rigg is director of the Kiwanis Gerrard "K" Boys' and Girls' Club, Toronto.

(mostly broken). This is a hazard, particularly to our children and pets.

Abusive, slanderous, and profane language has been directed at many of our tenants, specifically at our elderly tenants in order to anger them. The new shrubbery and grass is dying due to lack of water as these children turn the sprinklers on our tenants, bend them to the point of breaking, and have broken off an exterior watering outlet. A wooden railing has been broken from the children sitting on it.

Individuals (and their animals) have been threatened if they take any steps to notify the police.

We sympathize with this problem; however, some of our tenants are terrified and one is moving out. We feel that something must be done about this situation. The general attitude is "if the police won't do anything, how can we?" or "if we don't bother them, they may not do any damage." These do not seem to be viable solutions.

The Community Drop-In Centre

In our Gerrard Kiwanis Boys' and Girls' Club in downtown Toronto, we have a membership of 800 boys and girls, 7 to 17 years of age. We have an open door policy, regardless of creed, color, or condition, with a membership fee so low that the poorest boy or girl can afford to belong on an equal basis. It is an "Open Door" that leads to the constructive use of a child's spare time. A boys' and girls' club is established to meet the unmet needs and interests of youth. The Club is operated by the Kiwanis Club of Toronto from a Trust Fund from the late T.P. Loblaw, which was set up in 1933.

The Club operates on an autonomous basis in its own community and is concerned with providing hundreds of useful hours to boys and girls who might otherwise be spending their time in idleness, or worse, getting into mischief. Now when judges and probation workers in social welfare and juvenile courts publicly state: "that juvenile delinquency has been dramatically reduced as a result of boys' and girls' clubs in the area," and when church and school authorities commend the operation of the Club as a

force for good, the boys' and girls' club justifies the confidence placed in it by those who support it. Yes, boys' and girls' clubs do achieve results in character building for citizenship.

Teenagers are becoming the great unwanted and hence the great unserved in far too many community agencies. Youth-serving organizations are having increasing difficulty attracting, keeping, and meeting the needs of teenagers.

Youth work needs to examine its place in the "rock 'n' roll" world of the teenager. The best advice we can give teenagers is, "Don't expect too much out of life too soon--either from yourself or from society. Take your time, that's all."

Some of the difficulty in attracting and keeping teenagers may be based on the fact that teenagers are harder to work with; they are more demanding and less willing to accept automatically everything that we as adults say and do. Because they are beginning to "question" is no justification for making our programs (intentionally or otherwise) unattractive to this large segment of our potential membership, who because of their physical size and loud behavior, get into the most difficulty with adults. On the other hand, authorities in child development agree that the teens are also an age of new hope for changing attitudes and re-establishing positive patterns of behavior.

Perhaps even trained youth workers have forgotten that, above everything else, the teenager takes himself very seriously. He's aware that he's a lot of trouble to his parents, his teachers, and his youth leaders. He's even a lot of trouble to himself, because he can't understand many of the perplexing things that are happening to him.

Granted that the action of teenagers is filled with seeming contradictions. They're lethargic and day dreamers, yet boundless in their energy in an endeavor they like; they're often irresponsible, yet capable of assuming great responsibility; they're the personification of independence, yet they will do almost anything to be 'one of the group.' They sometimes appear to be insensitive to the finer things in life, yet they are oftentimes wonderful idealists. They consider a black eye a decoration, not a reproach. They're assertive, critical, questioning; they make mistakes and yet,

above everything else, they take themselves seriously. In short, they're making noises like an adult.

Needed - New Approaches

A common mistake among some youth workers is to make the older boy and girl program *merely an extension* of younger boy and girl activities. Instead, we should realize that the adolescent is in the process of rapidly becoming an adult; therefore, teenage activities should constitute an introduction to adult programs rather than merely a step up from children's programs.

Each agency might examine carefully the areas which need to be explored (and perhaps expanded) to meet this challenge of holding the teenager.

Climate

Young people, with their developing independence and consequently their need for greater freedom of choice, are particularly sensitive to the climate of agency life. Because they are confused about their relationships with adults, they are often hostile to inflexible and rigid adult demands.

Since the staff bears the major responsibility for creating the Club's climate, it must have the ability to reach out and provide an accepting, comfortable atmosphere. Workers who look upon all teenagers as noisy trouble-makers instead of young people seeking adult status, will experience difficulty in relating to and gaining the respect of the teenage group.

Unless the entire staff, from janitor to director, is friendly and accepting of the older boy and girl, the Club will not hold such boys and girls despite any efforts to provide a fine program and the best of facilities.

Facilities

The adolescent is reluctant to associate with younger "kids." He even has an aversion to the name "Boys' and Girls' Club" and would undoubtedly prefer some other term for his program.

It is important to provide this group with a drop-in area or lounge which is easily accessible and yet will give them some degree of privacy from the younger boys and girls. Such a room or area should be relatively free from any rigid schedule or programming.

It should contain some ping pong tables, billiards, a magazine and book section, a record player with popular records, and perhaps a TV set. The lighting, tables and chairs, and other accessories should be cheerful and comfortable.

Programming

The teenage program *cannot* be very effective unless *qualified* and interested staff members are specifically assigned to work with this group. The program should be developed *with* and not *for* them. Thus it is quite important that channels be provided for the older members to participate in the planning of their own programs and policies.

Now we are aware that alcohol and solvent sniffing is a very vital hindrance to the community and to the people concerned, and you know the dangers. Solvent sniffing is used mainly by the 8 to 16-year-age group of boys and girls, and it is a problem that has been with us for several years. Many glue sniffers have wound up in Juvenile Court and some have been put in hospitals to try to straighten them out. I would think it would be most difficult to write and to enforce laws against glue sniffing.

For one thing, there are many products sniffers use that give off the dangerous fumes, not only the airplane-type glues. Enforcing the law would be harder than enforcing Prohibition. *The better course, it seems to me, is to teach young people how much they harm themselves by indulging in the habit.*

As with virtually anything else, except patent poisons, there is no way to specify the length of time before the body is harmed. The potential harm doubtless begins with the first sniffing. In any event, the fumes from these products are known to be so dangerous that they carry warnings on the labels telling people to use them only in well-ventilated areas. This is to protect the health of the people who are using the glue, or other products, for legitimate purposes.

Yet, foolish youngsters do the exact opposite and suck the perilous fumes into their lungs desperately.

Results: accidents; crimes--sometimes death; sometimes vicious drugs; often liver and other damage, which may not reveal its true severity for years. *Glue sniffers are mixed up persons who need psychological help.*

The following is a letter from a mother of our boys' and girls' Club, who is now our arts and crafts teacher. She had four boys in the Club who were sniffers at the time the letter was written.

Presented by a Gerrard "K" Mother

Solvent Sniffing

I am sure that you are all aware of the new use given to such solvents as airplane glue and nail-polish remover, namely 'Cutex.' The younger people of the area are utilizing these solutions in a very dangerous and haphazard way. The term that so describes this action is 'sniffing.' As was said above, everyone has been informed of this abuse of such solvents, but there are very few who know the results of using them in this way.

I am a parent, and I am qualified to state the above as I have had experience in trying to cope with the situation. When this problem first arose in my household, I acted as a typical, ignorant parent in that I blamed other children for leading mine astray. In certain aspects, this could be considered to be true, but I realize now that the fault is mainly our own. I say this in that the individuals must have consented to do this in their own minds before they proceeded to sniff.

My purpose for composing this small piece of literature, is to enlighten and to inform you, the reader, of the dangers of this action.

During my nine years of residency in this community, I have met some reasonable and responsible people. I only request that we do something to stop the spread of this dangerous action.

This problem has been recognized as a very vital hindrance to the community and to the people concerned.

There are many mothers who are trying to raise their fatherless children and you will find that society has a trend to blame this as one of the reasons. On the other hand, there are children who have both parents living at home and this same situation occurs. The marital status is of no importance. How are we to fight it as parents? We are living under a severe strain. When this situation arises, then tension becomes greater. As a result, the neighbors are turning on one another and many hard feelings are made against families whose children are involved. Parents become very vicious through this. As long as these situations exist in the community, nothing will be solved. We must first become cooperative and understanding to acquire a better attitude toward the topic. We are all greatly concerned, as parents, of the possibility of the serious dangers to the health and development of our children. Violence and panic result in none other than confusion and disorder.

A great deal more can be accomplished through simply talking the matter over with constructive criticism and plain logic. The act of sniffing is punishable by law. I suggest that before the law is involved in your family, we get together and solve, or attempt to solve, this problem ourselves. As parents, we should not be ignorant of the facts about sniffing.

First, we must find out who the children are that have been indulging in this violation. Next, we must try to convince them of the dangers of sniffing. It is easy to detect whether or not certain children have been sniffing. They have the general characteristics of a person under the influence of an intoxicating beverage, and the odor of the solvent that they have used lingers with them for quite some time. If you discover that your child has been sniffing, don't act violently. Discuss it with him/her constructively. I feel that it is a good idea to ask him why he did this. The only way to solve a problem is to get to the root of it and work from there.

The police force, along with the Youth Bureau, is doing a wonderful job, because they are concerned about the well-being and social stability of today's young people. They realize that the results can be tragic and they may be parents themselves. The few that are caught will be helped

if they so desire to be, but the others are dealing with their lives, and I feel that it is our bound duty as parents to get to the root of this sniffing and rectify it as soon as possible.

Once it becomes a habit it is very hard to stop as is cigarette smoking. The users need immediate help. Please help me give them this assistance. Everyone is entitled to a mistake. Please regard it as being a mistake if you find it in your own family. Help in any way you can. Collect your thoughts before saying or doing anything that you may later regret.

Need we see someone die before we do something about this desperate problem. The time to act is NOW!

There are handbooks and booklets, published by the Education Division, Addiction Research Foundation, which are designed for this purpose. These booklets are *available now* and are provided for the public *free of charge* in Ontario. They contain all the vital statistics about sniffing. They can be acquired at such places as doctors' offices, health centres, boys' clubs, etc. Please use them before it is too late.

I feel very strongly that you, as parents, owe it to yourselves and your children to do whatever you possibly can in rectifying this problem.

Remember: Without mistakes--there is no forgiving. And with forgiving--there is no love.

P.S. If you feel that there is anything that our community could possibly do to slow down and maybe eventually even stop the abuse of such solvents, I suggest that we arrange some kind of a 'drop-in' centre, with these thoughts and this goal in mind.

* * *

Some teenage problems we have experienced around our Club: (13 to 18 years)

1. drinking; 2. sniffing; 3. smoking; 4. drugs; 5. aggressive behavior to club leaders; 6. bottle breaking; 7. gambling--penny toss, cards; 8. annoying people in the neighborhood; 9. swearing.

* * *

From last month's Community Newspaper which is published by the tenants in this big O.H.C. project which houses young people, and where at the Gerrard "K" Club we draw 60% of our boys' and girls' club membership:

Security: Many problems concerning this subject were mentioned. The porch lights have been pulled out and also the hall lights. The tenants complained that the security guards did not respond to their calls or took too long in answering their complaints. The question was raised: "Why can't the guards patrol the parking lot?" or "Why couldn't they patrol the halls?" The supervisor explained the fact that the guards cannot arrest anyone unless they catch them in the act of committing a crime.

He also said that there are only three guards in all of the O.H.C. project, two in the north and one in the south. They report to their calls in order of priority which sometimes makes it difficult for them to respond immediately to all their calls.

It was mentioned that the teens are largely responsible for the damage in the buildings. The reason most of these teens are getting into trouble is the lack of recreational facilities. A Community Centre would be most helpful but funds are needed to furnish it. A suggestion was made that the Unit Reps. should be on the first floor of the building to help prevent some of the damage.

* * *

Conclusion

1. In this area we need special drop-in centres with qualified staff to cater to age groups 14 to 18 years, boys and girls--especially in high density areas of this city.
2. We need a special work program for school drop outs, regardless of race, color, or creed.
3. We need a lot of help from government and industry to set up work programs for boys and girls age 15 to 18 years, where they can earn *some* money during the summer school vacation period, especially in this needy area of Metropolitan Toronto. What happens when they have no shoes, etc.? We know they have so little skills at this age, but it gives these boys and girls self-satisfaction to

earn some dollars to purchase their needs. First think of the costs to the government, etc. when one teenager is charged. For example, last week three of our boys, 16 and 17 years, were arrested on Mount Pleasant Road for assault and causing a disturbance. They were kept in the Don Jail overnight--let out on bail--each had two court appearances to set trial date. Sum up: costs to police, legal aid lawyers, court staff costs, etc.

4. I think in this great country of ours you people hold the key to opening up your businesses to these young people as apprentices, or making work programs with minimum salary during the summer break, which would alleviate many of the worries now confronting community and youth-serving agencies.

   The youth in our area are rough diamonds who just need a little polish--what are YOU doing to help?

SOLVENTS AND VANDALISM

by Michael Majury

As a police officer out in the street enforcing the law, I have had a chance to observe a part of our society that the general public never sees, and if they do catch a glimpse of it, they seldom see beneath the surface. Most people have never walked down a dark alley at night and observed some of the nightmares that take place in the shadows. I think it is for this reason that I have been asked to attend this seminar, so that I can relate to you my personal insight into some of these incidents. I would like to use the example of the twelve-year-old boy crouched behind some garbage cans with a plastic bag held over his face. As I approach the youngster the stench of glue is conspicuous. He drops the bag to the ground and attempts to stand, usually unsuccessfully the first couple of tries, but he finally does get up. A simple question such as: "What's your name," may get answered depending on how high he is.

Police officers have run into the same set of circumstances many times in the past and they all ask the same question: "What can I do for this child?" Well, the answer

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right now is nothing. Sure I can take him home, but home to what? The following is an example of a typical report on the home life of a youngster who has a history of glue sniffing.

Throughout his life and in his own home John experienced disorganization, confusion, inconsistency, and inadequate supervision. The home was apparently frequented by many men who were described as "winos" and alcoholics. Mrs. X, John's mother, is depicted as a dull, confused, deprived, and promiscuous woman who operates on a sadomasochistic level with men. She is ambivalent and inconsistent toward her children, often leaving them alone and unsupervised, but occasionally becoming so angry with them that she beats them severely. She is unable to relate to her children on an emotional plane and give affection and has very little understanding of her problems and feelings.

Although this child has a special problem, he is not an exception. He is what we call our average run-of-the-mill glue sniffer. In a great majority of cases the child comes from the single parent family living in the downtown core where housing and life can be cheap.

John is not the only lucky one in the family--he has five brothers and sisters.

Family Unit

Mrs. X	- 35 years, alcoholic
Mr. X	- Legal husband deserted the family in the early '60s
Common Law	- Moved in and fathered John and left shortly after he was born. He maintained some interest in the child by picking him up periodically and keeping him for a few days, until Mrs. X retrieved him.

Children

Donald	- 19 years, released from training school, address unknown
William	- 16 years, in training school

Anne - 15 years, in care of the Children's Aid

Mike - 12 years, crown ward

Lynn - 9 years, at home

The following details John's criminal record for the past five years:

1971 - Arson, two charges, committed to training school

1973 - Arson, charge withdrawn, witness dead

1974 - Break and enter and theft, committed to training school. He escaped custody during this stay in the school and while out he committed a robbery and was returned to the training school.

1975 - Escaped custody, returned to the training school

1976 - Robbery, withdrawn, the elderly woman whom he had knocked to the road while he was grabbing her purse is unable to attend court due to her poor health

1976 - Robbery, three charges, committed to training school

- Currently before the Court--four charges of robbery, one charge of break and enter with intent.

In all the above cases the investigating officer made a note during his investigation: "The accused appeared to be high on glue."

It should be noted that when a police officer uses the term "glue sniffer," he is referring to the adolescent or adult who abuses not only glue but aerosols and solvents of all types--from gasoline to contact cement remover.

The following report by his psychiatrist indicates John's mental health after a few years of glue sniffing.

John has been assessed as operating at an infantile level and is plagued by a complete insecurity about his own physical safety. His disturbance is so severe that he needs a one-on-one relationship with an adult at all times.

Other manifestations of his emotional turmoil are: (1) restless sleep; (2) fear of the dark, evil things in the

closet; (3) fascination with violence, death, and injury; (4) frequent questions of, "What would happen in?" (5) daydreaming, during which time he seems to lose touch with what is happening around him.

I think it is pretty obvious that John is asking for help, for someone to care about him, someone to call him a friend, and so are the majority of our glue sniffers. This is precisely the point I try to get across to the community. While this young person is high he will break your windows and cause thousands of dollars worth of damage. But what have we done to help him?

Where does the 15 and 16 year old go when he is not in school? If he is lucky, he has a boys club in the vicinity but they are usually geared to the younger child. Downtown in the core of this city there is not much to do but get into trouble--sniff glue, break windows, set fires, and get arrested.

What would happen if the community, instead of calling these young people criminals, took a long, hard look at the problems and made some effort to solve them. In some cases this is happening and it is working.

I was recently involved with a community in the downtown area that was suffering from a great deal of vandalism. They asked me what the problem was. I related the fact that if they took the time to go around the area and collect all the empty glue tubes, the problem would be pretty obvious to them. In one day several of the neighbors got together and collected the tubes from apartment halls and surrounding parks: they collected one-and-a-half bushel baskets full.

Together with the community and the help of organizations like the Addiction Research Foundation, we studied the problem and came up with a few ideas.

1) The first and most important point was that these young people have a problem and must be treated like people. The community decided instead of walking by, to stop and talk, to learn names, and to treat them like friends.

2) To seek funding and a location for a teen center. The center would have to have a professional staff with an

effective and structured program, and should contain services geared to these young people.

3) To remove from our community those people who exploit this unfortunate situation by making money on a few plastic bags and cans or tubes of solvents or aerosols. In fact, it was pointed out to me that there was actually a store in the area that would give a free plastic bag to a child who bought a tube of glue. By refusing to do any business with the stores that continually supplied solvent and aerosol products to the children of the area, we began to see results. The products were moved from readily accessible areas of the store to a place where the proprietor had more control. No large quantities were sold to the children without question. Children who repeatedly purchased the products were refused.

The vandalism has dropped drastically in the community. People are no longer frightened to walk through the surrounding park area. The teen center is flourishing and many of the children are receiving help.

This is only one small community in the downtown area, a place where the people cared enough to organize themselves and gain cooperation from all those involved. This area is now manning a successful program.

The communities that have successful programs and those who are still striving to attain a program still ask the same question: "What are the people who make these products, the manufacturers, doing about this problem?" The only answer I have is I don't know. From my involvement with this problem I have found that no one else seems to know what steps are being taken to remedy this problem.

SOLVENT INHALATION - LEGISLATIVE CONTROLS

by Vera Gellman

Historical Background

My interest in solvent inhalation dates back to 1960, when, as director of the poison control centres in Manitoba, I read an article from the National Clearing House for Poison Control Centres warning physicians about a new teenage fad which was appearing in the United States.

I thought at the time that it would not be long before the fad would spread to this country. Two years later, I was notified by the Manitoba College of Pharmacy that a Fort Rouge pharmacist had reported a sudden increase in his sales of nail-polish remover. Teenage boys were buying large quantities of it and when questioned, they explained that they were using it to "lace" coke.

I was sufficiently concerned about the possible dangers of this practice that I placed a notice in the *Manitoba Medical Journal* alerting physicians and advising them that the usual ingredients of nail-polish removers were acetone, ethyl alcohol, isopropyl alcohol, and amyl acetate. If physicians

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Dr. Gellman, M.A., M.B., B. Chir (Cantab), is chief of development, product safety branch, Consumer & Corporate Affairs.

were confronted with a case of intoxication at least they would know what they were dealing with.

By 1966 the fad had reached a peak: "glue sniffing" was now the "in thing." It was practised, often in groups, by teenagers from all socio-economic levels. Little was known about possible harmful effects and few of the youngsters cared.

Frightened parents, catching their children in the act, would drag them by the ear into hospital emergency rooms and poison control centres. By the time they arrived, the effect had usually worn off and the children were sober. In any case, there was little that we needed to do other than put them in a quiet room and wait for spontaneous recovery.

But by seeing and talking with these patients, we began to learn a little about why they "sniffed." There seemed to be two main kinds of sniffers. The "experimenters" sniffed in groups just for the experience and to gain acceptance with their peers. These youngsters usually indulged a few times and that was enough for them. The "loners" went off to sniff by themselves, repeatedly, because they needed the moments of escape which sniffing gave them. It was this type that really concerned us. They would usually end up in a hospital bed undergoing psychiatric evaluation.

These children often had behavior problems, were in conflict with their parents, had histories of truantism, or brushes with the law for theft. Frequently, their parents were alcoholics or separated and often there was a history of physical abuse. These youngsters had much from which to escape and it is no wonder they rapidly became dependent on the effects of solvent inhalation and were unable to give it up.

In a briefing paper prepared for the school teachers of Manitoba in 1966, I wrote: "Although the practice of sniffing is obviously not to be encouraged, it appears at the present time that in fact it involves but a slight hazard from the acute toxicity point of view. Our attention and concern should rather be directed towards the social problems which so frequently lie behind this deviant and irresponsible behavior. Counselling, guidance, and the direction of interests toward more rewarding forms of recreation are of the utmost importance. Above all,

sensational and ill-informed accounts in the press should be strongly discouraged. These only help to spread the practice."

But spread it did! In its quest for kicks, the adolescent ingenuity knew no bounds. Gradually, more and more products became known for their hallucinogenic properties: gasoline, lighter fuel, aerosol propellants, nutmeg, morning glory seeds, asthma powders, even banana peel had its day!

After these came pot--LSD, speed, barbiturates, mescaline, MDA, STP, etc. It was like some sinister plot unfolding with the entrance of morphine and heroin as the climax. Public concern became so great that in 1971, a special directorate--now known as the Non-Medical Use of Drugs--was set up by Health and Welfare Canada to deal with the problem, of which "solvent inhalation" is but a small part.

The following year I left Winnipeg and came to Ottawa. I never lost my interest in the solvent inhalation problem, but from my desk in Consumer and Corporate Affairs I seemed to hear very little about it. Could it be that the practice was dying out?

Poison Control Centre Statistics

In the summer of 1974, I wrote to five of the larger poison control centres across the country to inquire about their solvent inhalation statistics. The centre in Winnipeg replied:

> *The number of cases of glue sniffing treated at the poison centre has decreased in recent years, but I suspect that this does not indicate a decline in the number of sniffers in the community.*

From the Children's Hospital of Eastern Ontario came the reply:

> *My impression is that solvent sniffing as seen in our emergency department is more or less static. Our figures for all street drugs are declining from a peak of 317 cases in 1971 and 250 cases in 1972 to a little over 100 cases in 1973. The street clinic here has also been involved with fewer "street" drug problems. Yet, from the various news media, it seems that the drug problem*

is still around, particularly in smaller communities outside Ottawa. The hospital and community pictures, therefore, seem to be different.

The Hospital for Sick Children in Toronto reported:

In the last three years the number of patients treated in our emergency department for "solvent inhalation" averaged less than 10 per year. The most frequently involved chemicals were glue and gasoline.

The director went on to say that he suspected the *apparent recent decline is secondary to a quiet news media on the subject.*

Directors of the poison control centres in the maritimes and British Columbia also indicated a decline in their statistics.

I believe the decreasing involvement of hospital emergency treatment departments does not necessarily reflect a decrease in the problem. It is more likely that it indicates a changing public attitude. It is now recognized that with the exception of the occasional case which runs into serious medical trouble, active intervention in the acute phase of intoxication is neither necessary nor effective. Medical help is now more frequently sought when psychological dependence has already been established. Psychological treatment is the only effective therapy at this stage.

There is no pill, no medicine, no injection, no quick medical approach to solution of the solvent inhalation problem, and, as is often the case in frustrating situations, the public demands that the law find a solution.

Legal Approaches

One suggestion which has been put forward is to make sniffing illegal. The main problem with this approach is that it is practically impossible to enforce. Determined sniffers will sniff despite the law and others will consider it a challenge to be defied. It is worth noting, however, that despite these reservations, one province at least legislated against solvent inhalation. The Alberta Public Health Act makes it an offence "to use an intoxicating vapour to induce intoxication, euphoria, or hallucinations and to assist or

cause another person to inhale or otherwise introduce into his system such a vapour." Moreover, it is an offence under the Act to manufacture or sell a product for this purpose. The penalty is $100 or 30 days on summary conviction.

This legislation, then, gives a measure of *control* over the pusher but the provisions of the Act allow only *apprehension* of the user. The usual procedure is to notify the parents of the offender and place him/her under the care of a probation officer. Habitual offenders may be sent to a foster home.

Alberta is the only province to my knowledge which has specific legislation making it an offence to sniff.

In Winnipeg, the federal Juvenile Delinquent Act has in the past been invoked to apprehend users--not for purposes of punishment, but mainly as a means of ensuring follow-up care for offenders. This maneuver, if indeed it is legally acceptable, could presumably be used by other provinces.

A second legal approach which has been suggested is to place restrictions on the sale of the offending substances. But what are the offending substances? Any volatile hydrocarbon could produce euphoria and hallucinations when inhaled. Should we then restrict the sales of all household adhesives, paint thinners, lighter fluids, cleaning solvents, gasoline, marking pencils, lacquers, plastic wood, rubber cements, liquid solders, and aerosol products? All of these and many more contain volatile hydrocarbons and all are known to have been used for sniffing. Would limiting the ease of obtaining these products not encourage youngsters to turn to other, more dangerous sources--the halogenated hydrocarbons, for example?

On the other hand, as our department legal advisor points out: "While a child who is determined to indulge in sniffing may not be deterred by restrictive legislation, it is reasonable to conclude that limiting the ease of obtaining the product in question would discourage those who are less determined. Attempts to curb social evils through legislation can at best only be partially successful; but even partial success might be sufficient justification, considering that there have been deaths from misuse of solvents."

If we accept this argument, then have we an appropriate federal legal tool for making solvent inhalation an offence

and for placing restrictions on the sale of household chemicals containing hallucinogens? Let us take a close look at the Hazardous Products Act, this being the nearest existing statute to such a tool.

The Hazardous Products Act

The offence under the Hazardous Products Act is to import, advertise, or sell a hazardous product listed in Part II of the schedule except as authorized by the regulations. Note that the offence is to import, advertise, or sell--not to *possess* and not to *use*! The Act therefore cannot be used to make deliberate inhalation an offence. The Product Safety Branch legal consultant advises that there is, however, no reason why products with hallucinogenic properties should not be added to Part II of the schedule, since the act authorizes the governor-in-council to add to the schedule any product or substance "that is toxic" and "that is likely to be a danger to the health or safety of the public." The products in question certainly fit that definition. They could be added to Part II and regulations could then be made "prescribing the circumstances and conditions under which such products may be sold." The conditions would be that the product may not be sold to a child under a certain age--what age is yet another problem.

The Hazardous Products Act does provide for penalizing any shopkeeper who sells the product in contravention of the regulations. It does not, however, make provision for a more severe penalty for the "pusher"--one who knowingly sells a restricted product to a child for the purposes of inhalation.

The Hazardous Products Act, then, can only be used as a partial attack on solvent inhalation. It cannot make sniffing an offence, neither can it be used to discourage the pusher, but it could be used to place sanctions on the sale of products containing hallucinogens. Since it cannot be used to provide a complete legislative attack, it is questionable whether the Hazardous Products Act is the right legal vehicle to bring to bear on the problem.

If solvent inhalation still poses a major problem to our society, and if legislation is indeed the solution to that problem, then nothing short of a new statute would suffice.

It could be something along the lines of the "model law" suggested in 1972 by the Adhesive and Sealant Council of the United States. Their suggested approach was to enact a statute providing a substantial penalty for selling or distributing a product where the seller or distributor has reasonable grounds to suspect that it will be used for inhalation. In addition, deliberate inhalation would be an offence. This approach has the advantage of not penalizing the legitimate user in any way.

A more stringent approach would be a statute to ban the sale of substances containing organic solvents to children under a certain age, imposing a penalty to storekeepers who do not comply, and a more severe penalty for pushers. Presumably, the former approach is more acceptable to industry since this is the one put forward by industry itself. On the other hand, the latter, more stringent approach would better serve the interests of the younger generation.

Deterrent Additive Approach

An approach which has been widely explored by the adhesives industry is the addition of chemical deterrents to their products to discourage inhalation. Such deterrents could be irritating to the mucous membrane lining the nose or they could have other mild but unpleasant side effects. Unfortunately, out of more than 100 chemicals investigated by the industry, only six were potentially useful as deterrents. These have now all been rejected because their toxic effects exceed those of the solvents in question.

If a satisfactory and harmless chemical deterrent were discovered, it would be legally feasible under the Hazardous Products Act to make its addition to products one of the conditions of their sale.

Existing Controls

Let us now consider the legal controls which exist at the present time in Canada and the United States which are directly or indirectly related to the problem.

Firstly, in neither country is there federal legislation which attacks the problem specifically and completely. The Hazardous Products Act does address one aspect of the

problem, albeit in a rather indirect way. Under the Hazardous Substances Regulations to the Act, the following product categories are required to bear a warning on their labels stating that their vapors are harmful:

> *Petroleum distillates* or products containing petroleum distillates including naphtha, mineral spirits, stoddard solvent, kerosene, gasoline, mineral seal oil, and other related distillates of petroleum;
>
> Adhesives, cleaning solvents, thinning agents, and dyes containing *toluene* or *acetone*;
>
> Polishes, cleaning agents, liquid coating materials, paint and varnish removers containing *1,1,2-trichloroethane, 1-, 2-dichloroethane,* or *chloroform.*

In addition, this latter group of products must state specifically: "Do not breathe fumes," and the petroleum distillate-containing products, when packaged in aerosol form, must state: "Spray harmful or fatal if inhaled." It is questionable, however, whether such warnings on containers have any impact on determined sniffers.

In Canada, only one province has thought fit to introduce its own legislation relevant to solvent inhalation. In the United States no fewer, and possibly more than 20, separate pieces of state legislation exist. In various permutations and combinations, the offences include:

a) Intentionally to *inhale* for purposes of intoxication, euphoria, etc.;

b) To *possess* for purposes of inhaling;

c) To *induce* another person to inhale;

d) To possess for purposes of *inducing* another person to inhale;

e) Knowingly to *sell* to a person for purposes of inhalation;

f) To *sell* to a minor for any purpose whatsoever;

g) To *sell* unless a chemical deterrent has been added;

h) To *sell* to a minor without written consent from a parent;

i) Openly to *display* for sale.

Penalties for violations vary from state to state from a minimum of $50 or five days to $1,000 or a year in jail.

Approximately 45 volatile organic chemicals are specifically named among the 20 statutes as possible intoxicants.

Three states require the addition of a deterrent and the minimum age to whom a person may sell these potentially intoxicating products varies from 17 to 19 years, 18 being the most popular selection.

The supreme court ruling in an injury suit in Minnesota in 1973 gives an interesting insight into the court's attitude towards retailer liability. The court held that a state statute which bans the sale of glue to minors provides *absolute tort liability*; moreover, it extended that liability beyond immediate purchases if the original sale was in violation of the statute.

The case arose when a 14-year-old boy died as a result of sniffing glue purchased by his 13-year-old companion. The father filed action against the retailer and the retailer filed third-party claims against the purchaser (who also participated in the sniffing incident which led to the boy's death), and the manufacturer (who had, with the purchase order, included a clause in which he agreed to reimburse both buyer and customers for all "liability, cost, and expense arising from death or injuries" caused by the "use, consumption, or distribution of the glue").

The court said that the statute was intended "to protect minors, unable to exercise self-protective care, from harm resulting from sniffing the fumes of glue." It maintained that the statute's purpose "makes one who violates its provisions *entirely* responsible for damages or deaths which are the direct result of the illegal sale."

Even though the victim was himself violating a second statute which banned the possession of glue by minors, the court refused to allow the retailer's defense of contributory negligence on the part of the victim.

The court rejected the retailer's attempt to establish liability against the 13-year-old purchaser, on the grounds that the act of purchasing and furnishing the glue was dependent on the original wrongful sale of the glue by the retailer. "The sale," it maintained, "set the stage for the subsequent conduct of the minors."

Finally, the court refused to enforce the agreement between the retailer and the manufacturer on the grounds that it "relieves the defendants of the consequences of the public duty imposed" by the statute and such an agreement is against public policy.

In addition to rejecting both of the retailer's third-party claims, the court upheld an award of $11,250 and stipulated damages against the retailer.

Given sufficient publicity, cases such as this might certainly have some impact on the "sell" aspect of the solvent inhalation problem, but what about the "smell" aspect? How does legislation affect this?

To assess the effectiveness of legislation on the sniffer is almost impossible. Statistics comparing annual total arrests only reflect the degree of activity of enforcement officers. They give no indication of the deterrent value of the legislation. They tell us nothing about the subsequent attitudes and behavior of those apprehended.

From the police headquarters in Edmonton, we find that in 1976 peace officers received 43 complaints involving 84 juveniles, 53 of whom were males under the age of 18 and 31 were females aged less than 16. They made eight arrests, served 15 summonses, issued 23 charges, and 56 warnings. But, what became of those youngsters? Did one brush with the law curtail their sniffing? How many children would have sniffed were it not for the fact that it is against the law in Alberta? Do controls in fact have any place in the solution of this problem?

In December 1973, and the early weeks of 1974, a young officer from the prairie regional office of the Non-Medical Use of Drugs Directorate set out to gather information on the sniffing problem in the Winnipeg area. By hanging around the pin-ball parlors and dropping in on some of the youth centres and correctional homes, he managed to befriend a segment of the sniffing community in that area. His report,* both humorous and heart-rending, is a poignant account of the "insurmountable odds" from which these youngsters turn to "any kind of escape." "Solvent inhalation," he says, "is the cheapest means of getting there." But

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**Sniff: A Report on Solvent Inhalation in Winnipeg, Manitoba*, by Paul Sullivan. Research Bureau, Non-Medical Use of Drugs Directorate, Health and Welfare, Canada.

"because of the easy accessibility to 'sniff,' the problem is virtually beyond any control measures so far established. Incarceration, parental permission vouchers for children attempting to buy glue and solvents, substitution chemical composition of the product, and only displaying a small amount of stock have done little to reduce sniffing, but, probably *have* discouraged many children from starting in the first place.

"Sniffing" says the writer, "is a problem for hundreds, perhaps thousands of children in Winnipeg. Numbers are difficult to come by simply because the children themselves do as much as they can to obscure the practice. The most important conclusion cannot be expressed in numbers, however. This is merely the fact that for every kid growing up in a working-class or sub-poverty neighborhood, to sniff or not to sniff is one of those big questions he or she is going to have to meet head-on. So many of these decisions are made in deference to the pack, i.e. "peer group pressure," that if sniffing has a well-entrenched history on the block, or in the school, experimentation is unavoidable. The institution of successful sniff-prevention programs would mean no less than a full-scale social, cultural, economic, and consciousness revolution; and as I write this sentence, it makes me smile in its whimsy. An across-the-board restriction of solvent marketing and purchase would mean another law to abuse and the discovery of new, perhaps even more dangerous ways of getting high!"

*AN INTERNATIONAL PERSPECTIVE ON SOLVENTS AND AEROSOLS**

by Sidney Cohen

I would like to deal only briefly with the international perspectives of volatile inhalant abuse: first because these data are fragmentary, and second because only a few conclusions can be drawn from whatever information is at hand. Rather, I would prefer to address some issues which might make the intentional use of solvents more understandable.

What Do We Know of the World Situation?

Let's ignore the inhalation of trance-producing fumes of carbon dioxide by the Priestess at the ancient Temple at Delphi for purposes of prophesy, and also bypass the use of

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*Parts of this paper have been published in an article, "A Review of Inhalants - Euphoria to Dysfunction," C.W. Sharp & M.L. Brehm, ed., National Institute of Drug Abuse, Research Monograph Series, #15, 1977, Washington, Government Printing Office.

intoxicating vapors from the burning of strange vines in the Amazonian jungle by the native Indians. We might do well to disregard the ether frolics, the chloroform jags, and the laughing gas parties by the venturesome young college students of a century ago--except, perhaps, to remind ourselves that even before these anesthetics were known to medicine, they were exploited for recreational purposes by the youthful consciousness changers of those good old days.

Instead, with more relevance to commercial solvent abuse the first paper mentioning the problem that I know of is that of O.W. Clinger (1) who reported in 1951 on a localized outbreak of gasoline sniffing by adolescent boys in Warren, Pennsylvania. During the next decade or two, many articles were written about model airplane glue sniffing, and eventually about intoxication with every conceivable, and a few inconceivable, vaporizing liquids. Every area of the United States seems to have its huffers and sniffers. Reginald Smart and his colleagues (2) reported on their prevalence in three Canadian cities, and the problem north of the border resembles our troubles south of the border. Recently, R. Boeckx and F.J. Coadin (3) have told us about a spectacular "epidemic" of lead poisoning among the children of a tiny, remote Indian community in northern Manitoba, the result of voluntary inhalation of leaded gasoline for whatever "high" could be achieved.

Mexico sponsored the first international conference on the deliberate inhalation of commercial solvents a year ago because of their growing problem with inhalants. In addition to the North American countries at the meeting, representatives from a number of South American states related their national concerns.

We are well aware of the thinner problem in Scandanavia and in Japan. Recently I visited Manila where I was told that, in addition to sniffing solvents, an occasional child will breathe in car exhaust fumes for fun. Nor are the Communist countries immune, according to the articles coming out of East Europe. So its spread is fairly general, but it is also variable from country to country. One might assume that sniffing should be an urban practice--not so. Solvents, like gasoline, may be the only intoxicant available to youngsters and a few oldsters in very remote rural areas. B. Nurcombe (4) has described the use of petrol among

Australian aborigines for purposes of dealing with the tedium of their day. In at least one New Mexican reservation we have a few "Golden Indians," youngsters who prefer, for some reason, the gold and bronze spray paints to other aerosols.

It might be concluded from this brief survey of the international aspects of solvent abuse that some people will do anything to change their sober consciousness--especially the young of the species. They learn by mimicking the behavior of those around them and are therefore vulnerable to acquire destructive behaviors like solvent inhalation.

It must be with some measure of surprise that manufacturers and packagers of the various industrial solvents learn that their products are being deliberately inhaled for purposes of intoxication. After all, they go to great lengths to protect their workers from toxic exposure to a few parts per million during the processing of these materials. How are they to understand that there are people who wittingly and deliberately inhale high concentrations of these volatile fumes--chemicals that were never meant to be consumed by man or beast? Nor are the commercial producers and distributors the only group who are bemused by the spectacle of young people inhaling assorted toxic chemicals, some of which are recognized poisons. We in the health services profession also have difficulty comprehending why anyone would breathe in strange compounds--either those whose potential for harm has not been studied, or those studied and considered unfit for human consumption.

Why Are Solvents Abused?

Perhaps we should clarify why solvents *are* abused before we proceed to an overview of the nature of the problem. In an effort to understand why the inhalants are attractive to some people, I questioned those male adolescents who were referred to me for psychiatric assessment either by the juvenile courts or by private agencies. Ordinarily, multiple reasons were given for their indulgence in the volatile substances. When all the responses were analyzed, they seemed to fall into one of seven categories. Early in this exploratory collection of information, I realized that sometimes solvents were actually preferred to other less toxic

intoxicants. In other instances they served as substitutes for the more traditional drugs of abuse (for special reasons to be described).

In an uncontrolled, subjective study, that may apply only to the special Los Angeles population involved, I attempted to determine reasons for chronic solvent abuse. It should be noted that my inquiry into their motives for using was asked towards the end of the psychiatric interview, after I had gained some rapport with the clients. The following are the justifications for the use of solvents by my patients.

1. *Peer group influence.* The peer group is a very strong factor, perhaps the strongest, in initiating and perpetuating the use of specific intoxicants. Not only does the group dictate whether solvents or aerosols are to be used, but even which brand is currently favored, and how to use them. This does not mean that novel techniques and new products are not tried, but when the shift from paint thinner to clear lacquer spray to gold paint aerosols takes place, usually the whole group shifts over from one item to the other together. If one's crowd are inhaling something, it is very difficult for any individual group member to abstain.

2. *Cost effectiveness.* Cost was an important factor in the decision-making process about whether to use some inhalant. Many (by no means all) inhalant abusers are from low income families, and the price factor was a decisive element for some of them. Remarks like: "I can't afford anything else" or "It's cheaper than wine or pot," were made. A 75¢ can of varnish remover can intoxicate more people than a gallon of cheap wine. Furthermore, as one young man said, "If you're broke, there's always gasoline." Simply inhaling fumes from a car gas tank or soaking a rag or siphoning some off for later use, is widely known as a method of getting "stoned." When asked about the objectionable odor of gasoline, they claimed that it either wasn't so bad or that they got used to it quickly.

3. *Easy availability.* Although alcohol is commonly assumed to be the most widely available of all intoxicants, in fact, industrial solvents can be found even in places where alcoholic beverages do not penetrate. In poor households a stockpile of liquor hardly is to be expected,

but gasoline, paints, and a variety of aerosols are somewhere around. In very remote rural areas gasoline is the only intoxicant available to juveniles. The solvents are the easiest mind-altering substances for teenage youths to buy. In some communities there may be laws forbidding the sale of model airplane glue to underage youngsters. But these same teenagers can readily purchase dozens of other solvent preparations in supermarkets, hardware stores, or pharmacies. Even the five and ten-cent stores have a large selection to choose from. It is not even necessary to buy them; they are often displayed on open shelves, and shoplifting them is not too difficult. Among certain groups the theft of these substances is a routine practice: it's a point of honor not to pay for these products.

4. *Convenient packaging.* "You can put a supply in your pocket, and nobody can tell." A tube of airplane cement or a bottle of nail-polish remover can be concealed much more successfully than a pint of wine or a six-pack of beer. The compact packaging is particularly convenient for those who still attend school and like to sniff between classes.

5. *Mood elevation.* A number of the responses referred to the nature of the solvent-induced emotional experience. "It makes me feel good," or "I like the high" and "You aren't afraid when you're under" were some of the responses. The respondents seemed to be describing either a floaty euphoria or a blotting out of the unpleasant elements in their everyday life. I asked them how it compared with alcohol intoxication, and it was usually described as similar but not identical.

   The heavy, consistent users were, in effect, treating their feelings of frustration and depression with the state of oblivion that the vapors from some solvent can bring. They appeared unable to enjoy their life situation sober, either because of some personal inadequacy, a miserable family situation, or a deplorable social setting.

6. *The course of the intoxication.* In one respect solvent inebriation was rated as superior to that produced by alcohol. "It's a quicker drunk." The inhalation route produces a more rapid onset since it bypasses the gastrointestinal tract and liver and delivers the solvent

directly to the brain from the lungs. A further advantage mentioned by one client was that the drunk was over in an hour or so, rather than lasting all day as with alcohol. The solvent hangover is alleged to be less unpleasant than the postalcoholic state. Headache and nausea were the two most common complaints noted during recovery from inhalant intoxication. It is considered more reliably intoxicating than marijuana.

7. *The legal issue.* Only one person mentioned the fact that buying or being in possession of some spray can or other solvent was not illegal. The legality of solvents versus the illegality of marijuana or alcohol for this age group did not seem to be an important consideration.

From the viewpoint of the consumer the use of solvents, therefore, becomes more understandable. They have certain advantages over other intoxicants. But what about the dangers involved? Certainly no prudent person would deliberately inhale these materials. Unfortunately, prudence or worry about what can happen to their future health was not a particular concern of those who use solvents for recreational purposes.

Who Are the Solvent Sniffers?

At one time it could be stated with confidence that the abusers of household solvent preparations were adolescent males generally from some minority, low income group. This pattern has changed. Increasingly, females and young adults in their 20s are being identified as sniffers. Although all racial groups are involved, Mexican-Americans and Indians are over-represented in studies that include these cultures. Middle class whites are also found in school surveys and in treatment installations. Blacks are underrepresented in some surveys.

What is the Significance of Inhalant Abuse?

Aside from the morbidity and mortality associated with the excessive exposure to these chemicals, some significant issues are involved in this type of substance abuse.

Often, these are the first drugs of abuse, sometimes even antedating tobacco and alcohol use. This means that a

pattern of drug abuse is established at a very young age--in grade school, for example.

Since it is young children who tend to become involved with solvent sniffing, issues of their physical and emotional maturation arise. It is well known that growing tissues are more sensitive to toxic products than mature cells. Thus, damage can occur in pubescents at concentrations not likely to cause impairment in older persons. It is also during these formative years of life that techniques of coping with life stress are learned. If, instead of dealing with the daily frustrations and problems, a youngster solves them by solvent sniffing, then the techniques for coping with life's difficulties are never learned, and s/he remains emotionally immature, perhaps for a lifetime.

What Happens to Solvent Abusers?

As a rule, the inhalant abuser tends to "mature out" of habitual use with time. Unfortunately, the maturation consists of relinquishing solvents but becoming overinvolved with other drugs, sleeping pills or alcohol most commonly. Another pattern consists of simply adding various sedatives, stimulants, and opiates to the established inhalant habit and emerging as a polydrug abuser.

Good statistics are not available, but it is estimated that over 100 young persons a year die in the United States from their injudicious intake of commercial solvents. This does not include those who simply asphyxiate by shutting off access to oxygen by sniffing with their heads in a plastic bag. This practice is still occasionally employed in order to increase the concentration of the inhaled material. It also does not include another mode of death in connection with solvent inebriation, accidental injury. These people are clumsy while under the influence, have poor judgment, and have a tendency to be impulsive. This combination of traits is likely to cause falls from high places or other trauma.

What Types of Inhalant Abusers Can Be Identified?

As with most drugs of abuse, a range of involvement in inhalant misuse can be found. A large number of people are experimenters. They will try some volatile material once or

a few times and then discontinue the practice. A second group are occasional users. They use when the substance is available and the social setting encourages indulgence. The group at greatest risk are the daily users who are sometimes intoxicated a good part of their waking hours. These are the "glueheads," and they have the most serious of those with personal, familial, or social problems because they obtain most relief from the inhalant practice. They are hurting more in some sense, therefore they find greater relief from distress in an intoxicant.

How Can "Solventism" Be Prevented?

Health education to reduce the numbers of young people who will expose themselves to these exotic chemicals will have to start at a very young age. The first lesson to teach a child would be, "There are things in the kitchen, the garage, and the medicine chest that you don't swallow or breathe in; they are too poisonous."

We all have a responsibility to make access to solvents as difficult, not as easy, as possible. Making it more difficult will surely reduce its abuse. Allyl isothiocyanate has been added to the toluene in airplane glue in quantities to make its sniffing, but not its use as a cement, unpleasant. Another manufacturing firm claims that their model airplane glue is not intoxicating.

A number of communities have banned the sale of airplane glue to unaccompanied minors, but this just causes the youngsters to switch to some more available solvent. Actually, airplane glue is not used so much any more. The open display of packaged solvents such as these should be discouraged. Certainly, the more toxic products like carbon tetrachloride and benzene must be eliminated from commercial enterprises. Whether methanol requires such control remains a matter for discussion. The active ingredients in certain aerosols are often more dangerous than the propellants and solvents themselves. Manufacturers might consider placing the formulation on their packages to help those of us who must treat the acute poisoning. Probably, the fact that the formula is a trade secret hinders such a proposal.

Future developments outside the field of drug abuse may help the situation. Our concern with fluorocarbon aerosols

injuring the trophosphere might also accomplish their abolition as intoxicating agents. Similarly, the current move to remove lead from gasoline will reduce the instances of lead encepholopathy and lead polyneuritis in our gasoline sniffers.

Juvenile solvent abuse appears to spread along epidemiologic lines. A single or a small number of individuals introduce the practice into a community and it disseminates outward by peer group contacts. Utilizing the epidemiologic model, prevention would consist of quickly identifying the focus of infection and eliminating access to the substance. Those exposed should be identified and treated, and the involvement of additional new cases would be avoided. This procedure is difficult, but if we had an alert early warning system, it might be possible.

A more definitive approach will come when we understand the factors that impel a young person to continue to use these substances for purposes of intoxication. We still do not know why certain young people do this to themselves, or how we can teach them not to. A final solution will consist of corrective family and school experiences that will make solvent use irrelevant. Somehow the self image of these young people will have to be enhanced. We cannot depend entirely on external controls. Only the development of internal controls will provide an assured solution to the problem of solventism.

COMMUNITY APPROACHES TO THE CONTROL OF SOLVENT AND AEROSOL SNIFFING

by Adrian Wilkinson

The abuse of volatile solvents and aerosols is an episodic problem which has fads in different locations at different times. In some areas the problem is chronic. Studies conducted all over North America have produced surprisingly consistent descriptions of the population involved. This does not mean that solvent abuse does not occur in all strata of society and involve people of all ages, but there is a persistent preponderance of one identifiable group. This group is predominantly male, predominantly poor, predominantly adolescent, and in the majority of cases comes from a troubled home and has serious problems in school. These results have emerged from studies in Los Angeles (Sokol, 1965), New York (Davis, 1967), Denver (Alex, 1967), St. Louis (Chapel & Taylor, 1968), Toronto (Malcolm, 1968), and Vancouver (Blatherwick, 1971).

The majority of reported solvent abusers are males (Press & Done, 1967; Chapel & Taylor, 1968). In studies of high school students in Canadian cities, Dr. Reginald Smart and his colleagues (Smart & Fejer, 1971; Smart, Fejer &

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White, 1972) found that solvent use was more common in males than in females. The ratio of male to female users they reported (about 2:1) was, however, much smaller than the ratio of users coming in to treatment or into contact with the law. Of 30 consecutive admissions of solvent abusers to the in-patient drug unit of the Addiction Research Foundation, not one was female. Several other studies have found the same substantial preponderance of males among detected abusers of the drug. There is, of course, no guarantee that this ratio reflects the distribution of abuse of these drugs between the sexes rather than an unwillingness among females to admit to the use of solvents, and their consequently taking greater precautions to avoid being caught. However, the very large majority of males discovered suggests there is a sex difference in susceptibility to this dependence.

Solvent abuse occurs at all levels in society; but it is most commonly associated with low socio-economic status, particularly in large urban centres. In this respect the behavior has the same correlates as juvenile delinquency. This parallel also carries over to family factors. The literature on solvent abuse is filled with reports of the high incidence of family disorganization among solvent abusers. In many cases, the solvent abusers have a very high frequency of serious behavioral and scholastic problems at school, although they are not less intelligent than non-using controls. In fact, in a study in Denver, Colorado, Hanson (1967) found that measures of truancy and previous academic performance were the two single most powerful predictors of glue sniffing out of a wide variety of variables measured.

In the same study it was found that the next most powerful predictor was disorganization of parental relationships. Alcoholism and absent or violent fathers are frequently a feature of the domestic environment of the adolescent abuser of volatile solvents.

In the research of Smart and his colleagues (Smart, Fejer and White, 1972), a singular feature of the data was that the use of solvents was a behavior that was at peak frequency among students in Grade 9 and decreased in frequency thereafter. In clinical and criminological studies of solvent use similar findings have been made; that is, the onset of use

of these chemicals very frequently begins in early adolescence. In our clinical practice however, we have found that of the patients we see who are regular and heavy users of solvents, the mean age at admission to treatment is 19.5 years and the average duration of abuse of these substances is more than three years. The only young solvent users we tend to see are those who are brought for treatment by probation officers and occasionally by concerned parents. And although we have managed to keep the older solvent users in treatment for as long as other drug abusing groups tend to stay, the younger users of solvents are unlikely to remain in treatment for the course of the process. It is my belief that the treatment of this problem of drug abuse is, because of the population involved, most likely to be effective if it is offered in the community from which the adolescent abuser comes. The model of community intervention I shall present is developed directly from the work of Hunt and Azrin and their colleagues (Hunt & Azrin, 1973; Azrin, 1976). This treatment model was established to deal with the problem of alcoholism, but I think the principles upon which it was based can be generalized to other drug-using populations. Furthermore, since young solvent abusers typically do not present for treatment unless coerced, and typically are not easily persuaded to remain in treatment, community based intervention which will come to the clients seems to me the most appropriate intervention.

I shall begin by summarizing a variety of interventions that have been reported in the literature, and which have worked with varying degrees of success. I shall then briefly discuss the theoretical principles upon which my proposed intervention is based, and I shall suggest that the principal resources for such community intervention are often available in the environments in which solvent abuse becomes a problem. The difficulty is that these resources are typically not coordinated so as to deal coherently and consistently with the situation when concerned members of the community perceive the need. Such coordination of resources can only come about if there is a body in the community which ensures that it does. In a paper published in 1967, Press and Done argued that in order to deal effectively in the community "...what is needed is not the adoption of special programs, but rather the expansion and intensification of activities which are, or should be, already aimed at

the other problems mentioned." The other problems mentioned were emotional and economic deprivation, family disorganization, scholastic under-achievement, and delinquency. I shall argue that the existing community resources probably do not in fact need expansion, but rather coordination and focus.

Examination of the literature on interventions for solvent abuse shows that most treatments that might have been tried have been tried, with and without success, or more frequently with unreported success. Interventions that have been attempted are (see Weise, Busse and Hall, 1973):

a) adulteration of the substance most frequently abused;
b) legal sanctions for intoxication and police vigilance;
c) regulation of sales and access to substances in stores;
d) establishment of counseling and recreational facilities;
e) informal counseling by streetworkers;
f) special school programs;
g) enforced abstinence;
h) individual psychotherapy, with or without sodium amytal;
i) group therapy;
j) family therapy;
k) education about drug effects;
l) disulfiram (not tried, but recommended).

No study has been conducted which has satisfactorily compared any of these treatments with each other or with no treatment. However, the clinical experience of many of the authors suggests that many of these interventions, with the notable exception of enforced abstince (Press & Done, 1967), are effective with some clients. Note that the establishment of appropriate school programs, the appropriate alerting of the police, the provision of recreational alternatives, the offer of group therapy and family therapy, the cooperation of retailers of the substances, and the provision of educational information are all usually available community resources.

The community intervention model I want to describe is based on the work of Hunt and Azrin (1973) and Azrin (1976). They reasoned that if community reinforcement was arranged so that drinking by alcoholics interfered with other important sources of satisfaction, then drinking would

become less frequent. A program was planned so that satisfactions were arranged in the community that would interfere with drinking. The final program consisted of eight components which included:

1) the use of disulfiram to inhibit impulsive drinking;
2) the use of special motivational procedures to continue use of disulfiram;
3) a job counseling program;
4) marriage and family counseling;
5) a self-governing social club was organized for abstinent alcoholics providing the clients with enjoyable social events, especially in the evenings and on weekends;
6) clients were encouraged to develop pleasurable hobbies and recreational activities that would provide an alternative to drinking;
7) an early warning notification system was used to alert the counselor that problems were developing;
8) a neighborhood friend advisor was used to continue social support of the client after formal counseling was terminated.

This program very substantially increased the amount of time that the clients spent abstinent, working at home and out of institutions, as compared to a matched control group. The important features of this program are the variety of important areas of the clients lives in which the program focused its attention (marriage and family, employment), and the fact that the program was operating for the clients in their natural environment. I would like to propose that resources exist to establish similar programs in most urban communities where solvent abuse is most frequently a problem.

Why do solvent abusers inhale solvents? We have no definitive answer to this question. My belief is that they do so because solvent use has one or a number of consequences which are functional for the user, and because the normal deterrents to drug use are relatively ineffective. Solvents are very cheap drugs; their purchase and possession are not illegal in most jurisdictions and they are quite readily available in almost any neighborhood; so three principal deterrents to drug use--cost, legal costs, and lack of availability--do not apply strongly as counterpressures to use. What are the advantages for the user of the inhalation

of solvents? The reports of users suggest there are many. Initial use is very frequently reported to be a social phenomenon with peer reinforcement providing at least the initial reinforcement. Users also report the relief of anxiety and depression, the facilitation of fantasy,the facilitation of risk taking, and sometimes modelling the intoxicated behavior of influential others. There is neither experimental nor counter-evidence in support of these self-reported effects, so it is reasonable to accept them as working hypotheses in the absence of harder data. Drug use, according to these explanations, is functional for the user. He is unlikely to change the behavior unless the costs of its practice increase or the advantages diminish, or both of these events occur simultaneously. The problem is that the costs and benefits that most effectively control behavior are those that are in close temporal proximity to the behavior. This is why threats of brain damage, liver disease, emphysema, and cancer of the lung are so often ineffective as controllers of drinking and smoking cigarettes. The costs are distant from the behavior and unreliable in occurrence. In contrast the rewards and benefits of drug use come reliably and quickly after the behavior of self-administration.

In order to attempt to reduce the frequency of a behavior, a person can use one or more of several procedures which include:

a) increasing the amount of work required to gain access to the behavior;
b) removing other reinforcers if the behavior is emitted;
c) introducing unpleasant consequences for the behavior;
d) stopping the pleasant consequences of the behavior from occurring;
e) increasing the frequency of behaviors that are incompatible with the undesired behavior;
f) interrupting the chain of behaviors that leads to the undesired behavior.

All of these procedures have been used to attempt to control drug use. Consider the application of these procedures to the control of the abuse of solvents. One way in which the amount of work required to obtain access to drug-using behavior can be controlled is to reduce the number of outlets from which the drugs are dispensed. In

the case of solvents that are likely to be abused, doing so would inconvenience the retailers and legitimate users of the products. However, such merchandise can be displayed in such a manner that assistance is required in collecting it in the store, and cooperative retailers can question young purchasers about how the product is going to be used, and note regular purchasers. Retailers who instituted such procedures, particularly if it was done consistently and throughout the community, would almost certainly have an effect on the demand for such products for purposes of abuse, without simultaneously antagonizing legitimate buyers of whom they had asked questions of friendly curiosity.

Any reinforcer that has to be purchased with money, costs the buyer some of another reinforcer (money) when the purchase is made. The desirability of reinforcers can be regulated by regulating price. Such a manipulation is an avenue open to government in the case of recreational drugs such as alcohol and nicotine, but much less with chemicals whose principal use is not pharmacological. Such recourse is clearly out of the question in the case of the substances under discussion at this conference. In their program, Hunt and Azrin (1973) removed access to the social club organized for their clients when they were using alcohol. Similar contingencies can be made to apply with young solvent users if they use such community resources as drop-in centres and gymnasia.

The introduction of unpleasant consequences for a behavior is called positive punishment. It is a procedure that has been used to treat alcoholism (aversive conditioning) but it is not a desirable procedure to use whenever alternatives such as extinction through non-reinforcement or positive procedures are available.

It is also difficult to prevent the pleasant consequences of drug taking from happening. This has been achieved using narcotic antagonists which block the pharmacological effect of opiates so they have no effect when taken. No such option seems to be available with solvents.

I think the two most promising interventions are to increase the frequency of behaviors that are incompatible with or compete with drug use--as Hunt and Azrin (1973) did with their work and recreational counseling and by setting up of their social club--and the breaking or interruption of

the chain of behaviors leading to drug use as Azrin (1976) did with his problem-alerting system. In that system the client and his wife mailed the counselor a Happiness Rating Form each day. Changes in the rating by either partner alerted the counselor to the possibility of problems.

How should members of a community who are concerned about the incidence of solvent and aerosol abuse in their community respond to the situation. I propose that the first priority for the community is to draw together members of the community who are likely to have contact with the problemand to establish through that group *a common pool of information* so that the nature of the problem can be assessed as objectively as possible. The local agencies with staff who are likely to have some relevant information are community health centres, local schools, probation services, the police, social and family services, social and recreational services such as YMCA, church groups, drop-in and counseling centres, and local retailers. The information that such a group and their colleagues have must, as far as is ethically possible, be shared so the group can begin to make some statements about who is abusing solvents and aerosols, how frequently and how much of the chemicals are used, what particular substances are being used, and what are the principal sources of supply.

When the problem has been described as precisely as possible, some interventions can be attempted. One procedure is to attempt to make the substances consumed less accessible. This can be achieved, with the cooperation of local retailers, by removing from open shelves the materials most favored by abusers, and by alerting retailers to the fact that the substance is being abused in the neighborhood and suggesting means by which he may identify and discourage purchases by users without adversely affecting his legitimate trade. Most local retailers are likely to respond responsibly and cooperatively to constructive attempts to resolve a community problem, particularly if the organization responsible for the impetus represents several important community agencies and interest groups.

Secondly, some attempt should be made to recruit suitably qualified volunteers whose responsibility can be to coordinate the information in the information pool, and try to restructure the environment of the identified abusers of solvents so that other behaviors compete with solvent use

(e.g. club membership, satisfactory school work, sports, hobbies), or to reduce the frequency of events leading to drug use (e.g. family disputes, school problems, truancy).

Where can such volunteers be found? Most communities large enough to produce a substantial problem of solvent abuse are also large enough to house a university. All universities have departments of psychology and such departments typically offer courses in behavior modification. The students in these courses are sometimes offered some practicum experience in local hospitals or schools. However, the practicum opportunities are considerably exceeded by demand for experience. Students in the courses would make ideal case coordinators for the sort of community program I am suggesting. They would be supervised by a trained psychologist, and their training would lay major emphasis upon the production of changes in behavior and upon the objective assessment of client problems and progress towards alleviating those problems. For most students of psychology, the opportunity to put the academic training they have received to empirical and socially important test would be sufficient reward for the effort expended.

Hunt and Azrin (1973) focused their attention upon vocational, recreational, and family problems of their alcoholic clients, as well as taking measures to curb drug use. The principal focus of their efforts was contingent reinforcement for their clients in response to abstinence. I propose that essentially the same focus should be used with community approaches to solvent abuse. An attempt should be made to assess the contribution of school and family problems to the solvent use of each client and in those areas of activity attempts should be made to engender satisfaction for both parties in their relationships (pupil and teacher, parent and child) in the reciprocal manner described by Azrin and Hunt. Simultaneously, an attempt should be made to introduce the clients to rewarding activities, using existing community resources, so that these activities compete with the undesirable behavior of solvent use.

Summary

1) The first responsibility of the community where solvent abuse is considered to be a serious problem is to

assemble the appropriate community resources and assess the nature and extent of the presumed problem by pooling relevant information.

2) Sources of supply may be affected by collaborative work by the community group with local retailers who probably inadvertently supply the users.

3) The community group should attempt to coopt local students, eager for practical and rewarding experience, to work with the problem group.

4) In the case of each identified client his family, school, and recreational interests should be assessed and where indicated improved. Whenever possible, peer reinforcement should be used to motivate the clients.

5) In most cities large enough to produce a serious problem of solvent abuse, the resources exist in the community to generate a community reinforcement program to deal with the problem. Such an effort can only realistically be expected to be effective if the interventions in various areas are coordinated by concerted effort of the relevant members of the community. To do this, the knowledge of interested community resources must be shared.

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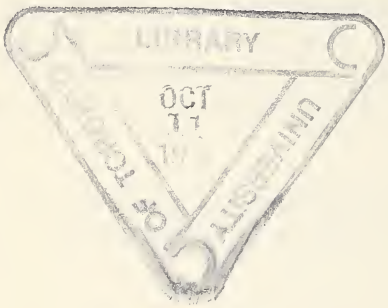

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